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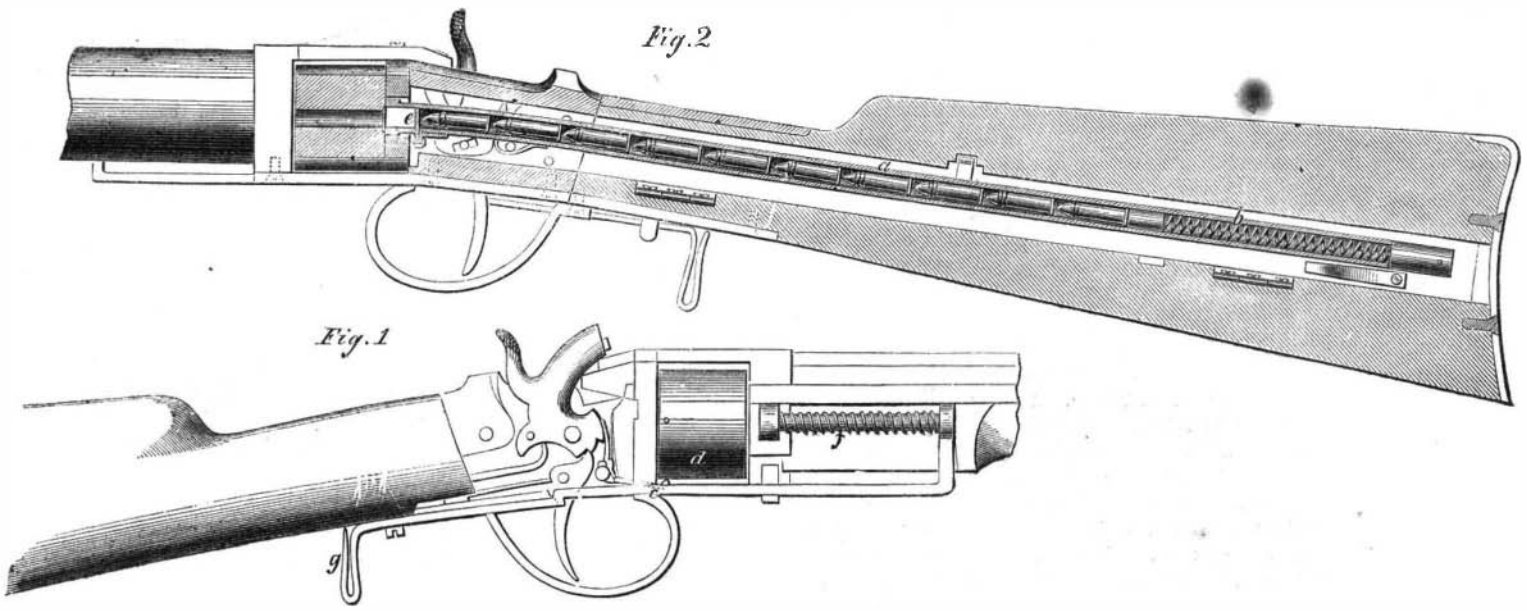
Improved Self-Loading Gun.

The accompanying engravings represent an improved gun, invented by Freeman Brady, Jr., and John C. Noble, of Washington, Pa. The prominent feature of the invention is the use of movable magazines adapted to be carried upon the person and to be readily inserted or removed from a chamber in the stock. By this means as many as twenty shots (the contents of two magazines) may readily be discharged within a minute. The construction will be readily understood from the engravings, of which Fig. 1 is a side elevation, and Fig. 2 is a vertical longitudinal section.

The magazine, *a*, is a long, slender tube which may



BRADY AND NOBLE'S SELF-LOADING GUN.

be placed in a chamber prepared for it in the breech of the gun. Several of these tubes are filled with cartridges and carried upon the person of the soldier or hunter, and when one is emptied it is removed and another inserted in its place. The chamber is opened upon the side of the breech throughout its length, and is closed by a swinging or movable plate. A spiral spring, *b*, presses the cartridges forward, and they are retained in the tube by a gate, *c*, which is removed after the tube is placed in the chamber.

The cylinder, *c*, is a many-chambered revolving breech, each chamber being brought in its revolution to coincide first with the tube, *a*, and afterward with the bore of the gun. When in line with the tube, the forward cartridge of the series is pressed forward into the chamber, and then, as the breech revolves, the cartridge is carried behind the bore, the rotation of the cylinder, *d*, cutting off all communication between the cartridges in the tube and the one to be discharged, and, at the same time securely closing the breech. The cocking of the gun, causes the cylinder, *d*, to revolve through an arc corresponding to the distance from one chamber to the next. This is effected by the point, *e*, catching into one of the holes in the periphery of the cylinder, the number of which is equal to the number of chambers.

The rotation of the cylinder brings each chamber after its discharge in line with the rod, *f*, when this rod is drawn into the chamber by means of the finger pressing against the projection, *g*, thus expelling the empty cartridge case. A succession of shots may thus be fired as fast as the gun can be cocked and the trigger pulled until the magazine is emptied.

A patent for this invention was obtained through the Scientific American Patent Agency on the 14th of January, 1862. The guns have already been manufactured to a sufficient extent to prove the entire success of the invention, and they have been highly commended by the authorities before whom experiments have been made. The parties are desirous of disposing of an interest or making such other contract as will enable them to commence their manufacture upon an extensive scale. All necessary information can be obtained by addressing Messrs. Freeman Brady, Jr., and John C. Noble, at Washington, Washington County, Pa.

To Prepare Aniline.

A fine stream of benzole and another of the strongest nitric acid are allowed to run together in a long glass tube, which is kept cool. When the two liquids come in contact they react on each other, heat is disengaged and nitro-benzole is formed. Commercial nitric acid, mixed with half its volume of sulphuric acid, may be substituted for the concentrated nitric acid. The nitro-benzole thus formed by the chemical combination of the benzole with the nitric acid, is washed with water first, then with a solution of carbonate of soda, to remove any free acid, and afterward with water. Nitro-benzole is a yellowish liquid which, when submitted to great cold, crystallizes in needles. Its odor resembles that of the oil of bitter almonds. It is almost insoluble in water, but is very soluble in alcohol. Nitro-benzole is the product from which aniline is made. The combination of it with hydrogen converts it into aniline, but there are various modes by which this may be done. One method of doing this is to place nitro-benzole in a glass vessel with chips of zinc Dilute sulphuric acid is now added; this attacks the zinc and decomposes the water, the oxygen unites with the zinc and the hydrogen is set free. The affinity of hydrogen in its nascent state (moment of liberation) is remarkable. It unites with the nitro-benzole and forms aniline, which is held in solution by the sulphuric acid. An excess of caustic soda is now added and the mixture is distilled, when the aniline passes over with the vapor of water. Aniline, when pure, is a colorless liquid, having an aromatic odor and an acrid, burning taste. It is soluble in alcohol and ether; its specific gravity is 1.028, and it does not freeze at 20° below zero. It dissolves sulphur and phosphorus, and is a powerful base, combining with acids to form salts.

Different other modes of producing aniline from nitro-benzole may be practiced, but none more simple than the above. In the early part of 1850, M. Vergnin, a chemist of Lyons, France, while experimenting with aniline discovered the process for converting it into a deep purple-red called fuchsine. This process consisted in mixing ten parts of aniline with seven of anhydrous chloride of tin, and boiling them together for about fifteen minutes. The mixture passes through various shades, and finally becomes very dark. Boiling water is now added, and the vessel containing it is removed from the fire. Some insoluble matters settle to the bottom and the clear is filtered while still hot. This filtered liquor contains the rich coloring matter, fuchsine, in solution. It is precipitated by adding common salt. As this dissolves in the liquor the coloring matter is deposited. The colorless liquid is poured off, and the precipitate is washed with water and dried. It is put up in its dry state for transportation; but before it is employed for dying it is dissolved in alcohol. It will color wool and silk a deep red-purple without a mordant. Various metallic oxides boiled or mixed in solution with aniline under heat, produce a great variety of colors.

The prices of pig iron in Scotland range at present from 47 to 52 shillings sterling per tun—about twelve dollars. The number of furnaces for making such iron is 123; their product last year was 1,050,000 tuns. Only 34,000 came to the United States against 77,632 tuns in 1860.

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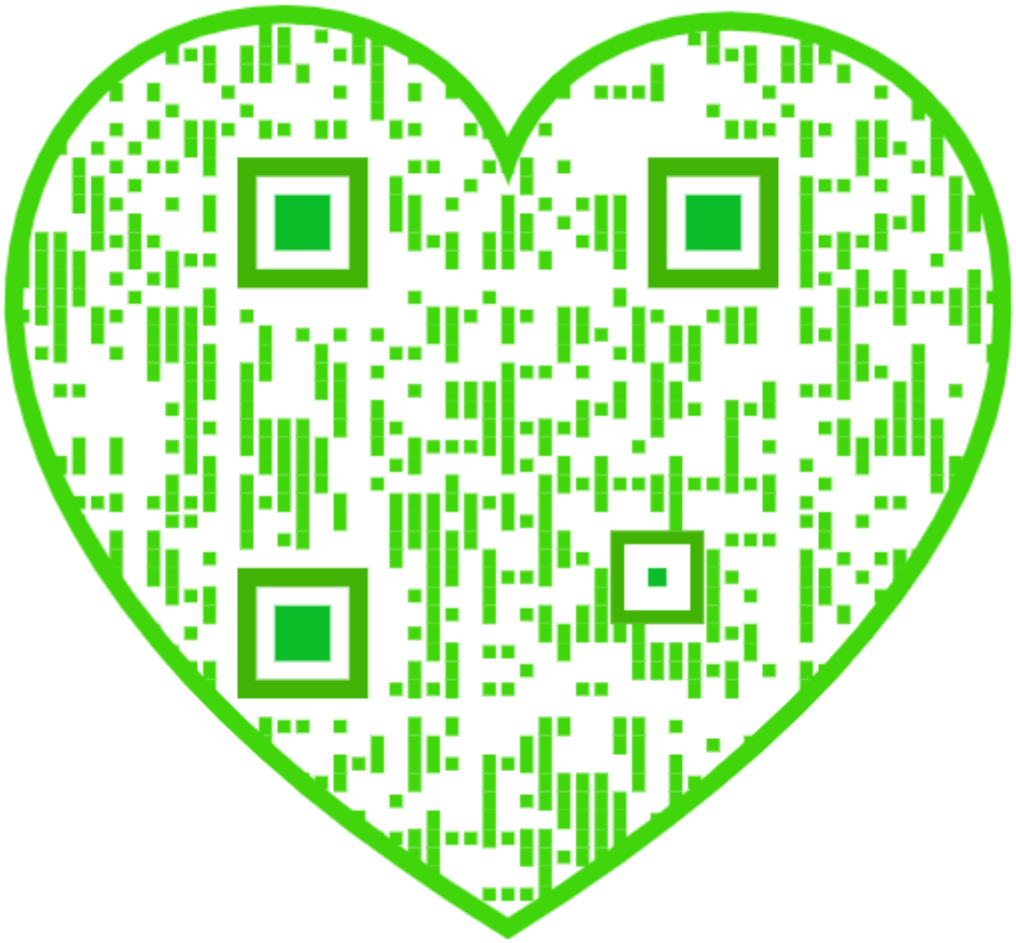

NOTES ON MILITARY AND NAVAL AFFAIRS.

THE SITUATION.

We have nothing of interest to add this week in respect to the general situation of affairs. All along the lines matters were progressing quietly. The object of greatest interest is the condition and prospects of

BURNSIDE'S EXPEDITION.

We announced the sailing of this formidable expedition in the SCIENTIFIC AMERICAN two weeks ago. Its supposed destination was somewhere on the coast of North Carolina, to complete the work begun by Gen. Butler and Com. Stringham in August last, when Hatteras was successfully attacked. The expedition sailed from Fortress Monroe on the 11th of January, and no reliable intelligence was received respecting it until the 28th. There was a subdued yet painful suspicion resting upon the public mind that ill winds had overtaken those gallant vessels and their noble armies of brave defenders of the Union, and that ill tidings would be the first news we should receive respecting it. The first news that reached the city seemed to confirm all the evil forebodings concerning its fate, and our people began to feel that a dark cloud had set over their cause; but when the facts became more thoroughly understood the relief was very great. The expedition, thank God! is safe. Gen. Burnside sent a special messenger to Washington with the following dispatches to Gen. McClellan;—

HEADQUARTERS DEPARTMENT OF NORTH CAROLINA,
Hatteras Inlet, Jan. 26, 1862.

We left our anchorage at Annapollis on Thursday, the 9th, and after a protracted passage, owing to dense fog, arrived at Fortress Monroe Friday night, at 12 o'clock. Leaving Fortress Monroe on Saturday, at 10 in the morning, we proceeded at once to sea; but owing to fogs on Sunday night our progress was very slow. On Monday, the 13th, the weather cleared, with a heavy wind and rough sea, which caused our vessels to labor very heavily, and some were obliged to cut loose from the vessels they were towing. Most of the fleet, however, passed over the bar and anchored inside the harbor about 12 o'clock, noon, on the 15th, just in time to escape the severe gale of Monday night and Tuesday. The propeller *City of New York* ran on the bar at the entrance to the harbor, and owing to the severe weather and want of small boats we could render her no assistance. She was laden with stores, and was lost.

The General also says that he had been led to believe that he would find experienced pilots at Hatteras, but had great difficulty in accomplishing his wish, for want of proper accommodations. He adds that he would commence that day to build a wharf for landing supplies. The men were cheerful and patient, and he would proceed with confidence. An accident occurred in an effort to relieve the steamer *New York*, by which a boat was swamped, and the lives of Col. Allen, of the Ninth New Jersey, his surgeon and a mate of the boat were also lost. After the arrival of the expedition at Hatteras, the enemy made their appearance in one or two vessels on a reconnoitering expedition. Our boats gave chase and drove them back. The transports and vessels grounded will be got off by the aid of the tug boats. Only one, the *New York*, was lost, and no lives, the three above referred to excepted.

Special reports to newspapers represent the storm to have been terrific, and it is a matter of surprise and congratulation that the damage to the fleet was not more severe. The steam propeller, *New York*, of 995 tuns burden, had on board a cargo of ammunition, rifles, bombs, tents, &c., valued at $200,000, and the steam gunboat, *Zouave*, 175 tuns, armed with three guns, were both lost. The guns of the *Zouave* were saved, but all else on board these vessels was lost. Other vessels suffered more or less damage, and some were aground in the sound, but it was thought they would be got off by the aid of the tugs and gunboats.

FRESH WATER NEEDED.

A correspondent of the *Times* says:—

One of the most serious difficulties now threatening the expedition is the danger that the supply of fresh water will be exhausted before we shall be in a condition to move to a point where it can be obtained. To think of finding sufficient to quench the thirst of this large army, and the naval force on the land near this point, is out of the question. There is but a limited supply on board each vessel, and something must be done at once, to guard against such a calamity as would overtake us in the event that the water fails. Several of the steamers have a condensing apparatus on board which furnishes a moderate supply, and there is one of Normandy's apparatus in full operation on the beach, going night and day, and turning out a thousand gallons each 24 hours. This machine was put up, and has been kept in operation by Mr. Edward Stillman, who is also about to set to work three others of inferior capacity—one on board the Commodore's ship, one at Camp Wool, and a third at Camp Winfield. The apparatus of Leighthall's, on board the *Sentinel*, makes 3,500 gallons a day. Altogether, we ought to make 6,000 gallons per day.

Normandy's fresh water apparatus is illustrated and fully described in Vol. II, No. 17 (new series) SCIENTIFIC AMERICAN.

ANOTHER GREAT NAVAL EXPEDITION.

Another formidable naval expedition is now preparing at New York and other points, which is to be commanded by Commodore Farraguet. It will be by far the most powerful naval force yet fitted out, and will consist of the *Richmond*, *Pensacola* and other large steam frigates, a great number of gunboats and twenty or thirty vessels carrying mortars and thirty-two pounders. The mortar fiotilla is connected with this expedition. Speculations begin to be rife among us as to the destination of this great fleet. It is no doubt intended to operate on some point where a powerful demonstration is required. These expeditions are harrassing to the Confederates in the extreme, and they are put to their wits' end to know how to meet them.

THE BATTLE OF SOMERSET.

In our last number we announced the Federal victory at Somerset, Ky. The battle was fought at Mill Spring near that town, and will probably pass under that designation. The victory was complete in every respect; Zollicoffer was killed and his whole army routed in disgrace. It was announced that the flying troops would make a stand at Monticello, but recent information states that Gen. Schoepff was occupying that place. There are many interesting details about this battle which we have not room to publish. The Richmond papers at first would not believe it; they declared that it was a Wall street dodge to raise the wind, but they were compelled to admit their defeat, and one of them declared it was more disastrous than the Northern papers led them to infer. We claimed a big victory at the outset, and if the secessionists suffered more than our journals stated, they must have been very severely whipped.

HANG THE RASCALS.

The beef and pork which is now being furnished to the army is the subject of much complaint. A large quantity of it comes from Philadelphia and New York, and no one appears to know how it ever passed inspection. Whole barrels opened in some of the regiments are found to be unfit for use. The coffee, tea and rice furnished the government for the soldiers is generally of the most villainous description.

The Chicago *Tribune* says an attempt was made to palm off cartridges destitute of powder in the ammunition for Enfield rifles served out to the Burnside expedition.

HOMEOPATHY IN THE ARMY.

The Committee on Military Affairs in the House of Representatives have under consideration the expediency of introducing the system of Hahnemann into the army. It was agreed to authorize Mr. Dunn to report a bill instructing the Medical Bureau of the War Department to permit, under certain restrictions as to number and qualifications, the employment of graduates of regular Homeopathic colleges as army surgeons. This measure has been fought bitterly in committee, and has for its opponents the entire present medical force of the army. Every effort will be made by the zealous disciples of the old school to defeat the bill; while the devoted and convinced beliver in *similia similibus curantur* are working with the intense ardor of younger and more enthusiastic reformers. We understand that Gen. McClellan, who is a firm believer in homeopathy, is anxious to have the system tested in the army. Why not try it? It has thousands of firm believers in the country, and is rapidly gaining ground. It would be far more economical than the older system, and if it should prove just as successful something would be gained in a pecuniary point of view. The SCIENTIFIC AMERICAN is the advocate of steady progress, and we can see no reason why a well-tried new system should not have a fair chance. Away, then, we say, with all blind prejudices, and give our army the benefit of the best systems. We care not what they are called, we go for the best.

MISCELLANEOUS.

The town of Biloxi, which lies on the Gulf of Mexico, is now in possession of the Federal forces. Commander Smith, with three steamers, went toward this place in search of a secession steamer. Not finding it he demanded the surrender of the place, which request was complied with. He destroyed a sand battery, seized two cannon and a vessel loaded with lumber, which was found very useful to our troops on Ship Island. The male inhabitants had deserted the town, and it was found occupied by women, children and hogs. We do not learn that any damage was done to either.

We have information through a Savannah paper that the Federal forces have occupied Cedar Keys, on the western coast of Florida, a small group of islands at the entrance to Wakasassa Bay. They are the western terminus of the Florida Railroad, connecting with Fernandina. There is a great deal of valuable ship timber in this locality.

The steam-frigate *Franklin*, on the stocks at the navy yard, Portsmouth, New Hampshire, considered by competent judges the finest specimen of naval architecture in the service, seems to have been overlooked both by the Navy Department and Congress. Her hull has been nearly if not quite ready for launching these several years, and an appropriation for an engine is all that is needed to put afloat one of the finest vessels in the world—larger than any of the steam frigates now in commission, and fitted to mount sixty guns of the heaviest caliber. Wonder is expressed that no movement has been made to secure the completion of this ship.

A large number of 13-inch mortars have been passing for the last few days through Harrisburg, on the Pennsylvania Railroad, to Philadelphia, *en route* for the city of New York. They were cast at the Fort Pitt Foundry, near Pittsburgh, which establishment has turned out some of the heaviest ordnance in the service, in addition to a large supply of smaller material.

Secretary Stanton.

TEST OF AN INVENTION.

The special correspondent of the *Tribune* states that a patriotic inventor recently entered the office of Secretary Stanton, and proposed to sell the Government a patent armor, when the following dialogue ensued:—

SECRETARY—Has this been examined by a Board of officers?

PATRIOT—No.

SECRETARY—Then I propose a test it myself. Put it on, and I will have you shot at.

PATRIOT—Some part not protected might be hit.

SECRETARY—No danger of that, sir; get Colonel Berdan to shoot you; Colonel never misses, sir.

PATRIOT—nonplussed—I don't consider that a fair test.

SECRETARY—I do; and I don't think much of a man who declines a test that he is willing to subject my soldiers to. No, sir. You can't sell patent-safety contrivances to this Department; but if you will bring an invention here which will push our armies on to the rebel forces, I will buy it. Good morning, sir.

ESSAY ON CHEESE.

A Western man, who said he hailed from the Reserve in Ohio, had about a dozen quires of paper written over two or three times, which he said was an "Essay on Cheese." The Secretary laughed! "You must go to the Commissary General; he has charge of feeding the army." "I have been at first one and another all summer, and somehow or other I do not get any further ahead, and that is why I want you to investigate it;" and he commenced to unroll his papers. Indeed, sir, I do not know how cheese would agree with the soldiers." "That's just why I want you to read these papers and examine these certificates." "But I have not time, sir." All hands commenced laughing, but the Ohio man stuck it out bravely. "I assure you that there is not a soldier in the army who does not like crackers and cheese, and I can make it for three cents a pound." "Now I tell you what you had better do, go to Senator Wilson and get him to put it in his bill, it will then pass the Senate and become an army regulation to give out cheese rations." Well, could you not indorse it, and then it would be sure to be passed?" No, I cannot indorse it, because I know nothing about it." Oh, well I will leave these papers," and he made for the table. "I will never read them, if you do, until the war is over." With a look of despair, Ohio made for the door, inquiring of every one he met if they knew where Senator Wilson lived?

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Wall-Sided Ships Condemned.

The old school of British shipbuilders complain of a system of modeling which has been recently adopted in England both for ships of war and merchantmen. This system embraces wall-sides in preference to the rounding inclination, which may be seen in all our own old ships of war and in many of our best modern freighting vessels. A writer in one of the English papers says :—"In looking at the *Warrior* from aft you are struck with one prominent feature—her wall-sides. This form has not only been adopted by the Admiralty, but prevails in the construction of our modern merchant steamers. To it I attribute, to a great extent, the rapidly-increasing number of them lost. Several iron-built and well fastened screw steamers in the Baltic trade have gone down with all hands, already this year, and the number without doubt will be increased whenever a gale is met with by any deeply-laden, wall-sided steamer. Why are these wall-sided vessels adhered to when experience has so repeatedly condemned them?"

On this subject the *Commercial Bulletin* (Boston) remarks :—

It is well known that our own most successful vessels of war have been remarkable for the inclination of their sides. All our sailing frigates have bold, rounding sides, and finer vessels of their class have not been produced by any other nation, but like the English our modern steam-frigates are rather wall-sided, particularly those which have been built recently. Our new gun-boats are also too flat along the sides to be safe in heavy weather. Experience has shown that a vessel to sail well must have a good foundation, and this cannot be obtained with wall-sides. We are aware of the scientific reason why propellers are built long and narrow, in contradistinction to having "kettle bottoms." It is, because the latter displace too much water, and thereby offer too much resistance and as speed is the principal object, safety is not sufficiently taken into consideration. In our merchant steamers we notice the same peculiarity—they are all wall-sided, and they all roll tremendously in a heavy sea, because they have imperfect bearings at the line of flotation to check them.

We consider this a very important subject, and hope our shipowners will examine it carefully before they have any wall-sided vessels built. In our merchant ships this new notion is not very prominent, because our mode of measurement would tell against it ; yet there are a few flat sides in our mercantile marine. The desire to obtain large stowage capacity, with a small register, has preserved for our trading vessels the good old fashioned rounding sides.

Mechanical Substitute for Horses in War.

Whether we shall ever find a perfect substitute for cavalry in war may perhaps be doubted, or whether any cavalry, however rapid and perfect, will be able to charge in face of a body of well trained infantry armed with rifles of long range, is a matter that will have to be proved by experience on some grand battle-field. In the last grand charge at Waterloo, the head of the advancing columns of Napoleon "melted away" even before the old-fashioned guns brought to bear upon it, so as to render advance beyond a certain point impossible. How much more will rifled cannon and Enfield rifles do this in future!

But for military transportation there can be no doubt that horses will and must be set aside by degrees, by the superior advantanges offered by steam for drawing heavy weights, even on common roads. At any rate this war has exhibited some of the disadvantages under which we must and do labor where dependent on horses and mules. Hence it is that the enemy has been so careful of keeping railroad connections in their rear, and so much more successful where they can do than this in Western Virginia. Facilities for transportation are everything in such cases, and the saving of horse and mule flesh is beyond calculation. If the locomotives now employed on railroads could be so modified that on arriving at the end of the rails they could run on common roads, though they might draw but a quarter or even a tenth part of the usual train, or no more than equal to ten or twelve horses each, how great the advantage.

There has been no part of the public expenditure, about which there has been so much just complaint as that in horses. The frauds have been immense. Horses that have been sold and condemned, bringing not more than from one to five dollars each, are most of them such as ought never to have passed inspection. Many of them have introduced contagious diseases among the horses that were valuable. All of them have to be long trained before of much value, and to be fed and groomed daily at a vast cost, whether at work or not. For the transportation of heavy guns on common roads, they are a most costly motive power, so that in point of fact very little of this sort of transportation is attempted.

One quarter of the money wasted on poor horse flesh would, if expended in proper trials and premiums, have put the government in possession of locomotives or steam carriages adapted to haul cannon and all heavy army supplies on common roads. These could be constructed with wheels of such a breadth as not to mire or sink down on common roads except where any means of transporting cannon must sink down, owing to the weight. They would not require food (*i. e.* fuel) except when at work, would not be subject to diseases, or need months of training nor be liable to a stampede if placed under fire. They would afford facilities for a greater concentration of hauling power at a given point to a degree that the power of no number of horses could be brought practically to bear ; while the price per horse power of a steam engine could be brought far lower than the present government price for horses.

Let the government draw up specifications for an engine that shall weigh a certain amount and be able to haul a certain number of tuns on a level road, or on a road of any given inclination, offer a fair price for those engines presented that shall fulfil all their conditions, and to contract, at a given price, with responsible parties, for a sufficient number of approved engines, and we have no doubt that in a little time three-quarters of all the teams now in use at such vast cost would be superseded, and the army supplies better and more quickly transported. Such engines could be made to place themselves anywhere, and operate as stationary engines for all the purposes for which steam is and can be used. Put on top of a hill they could draw cannon up and then trot off with them to any desired point. They could be better protected than horses from the guns of an enemy. All the working machinery being under iron-clad mail.—*Phila. Ledger.*

Recent Experiments in Using Steam With and Without Expansion.

Mr. H. P. M. Birkinbine, Chief Engineer of the Philadelphia Water Works, has communicated to the *Journal of the Franklin Institute* an account of some experiments lately made with a pumping engine at the works, using steam at full stroke, and expansively with a cut-off. He says, this engine was originally so arranged as to carry steam the entire length of the stroke. The valve gear was much worn, and defective in its arrangement, a new valve gear was put upon the engine, by which the steam could be cut off at any point of the stroke. The experiments to test the value of this improvement were not made with the precision and care they should have been for publication, but were made simply for the use and information of the department. The results may, however, be taken as practically correct, although more carefully-conducted experiments might make a slight difference. The load upon the engine and the condition of the engine pump and boilers were the same in both experiments. In the first experiments, and with the old valve gear, it required careful firing to keep the engine in motion at any thing like a fair speed—say twelve revolutions per minute. In the experiment with steam cut off at half stroke, as the engine is now running, it is kept up with ease. Steam was not cut off at less than half stroke, on account of the boilers, which are old, and not considered perfectly safe at over sixty pounds pressure. It will be seen that this engine is not economical in fuel, nor is it constructed on the most approved plan, but these experiments show the economy of using steam expansively, in this instance, at least.

The diameter of the cylinder of the engine, horizontal, non-condensing, 30 inches ; length of stroke of piston, 6 feet ; cubical contents of nozzle, and clearance at each end of cylinder, 1.5 cubic feet ; diameter of pump cylinder, double acting, 18 inches ; stroke of piston of cylinder, 6 feet ; diameter of fly wheel, 22 feet ; weight of rim of fly wheel, 18,000 pounds. There are six cylindrical boilers set in brick work. Diameter of boilers, 40 inches ; length of boilers, 26 feet ; diameter of heaters, 30 inches ; length of heaters, 16½ feet ; total heating surface, including one-half of the whole surface of boilers, and the whole of the surface of heaters, about 1,500 square feet ; area of grate surface, 200 square feet. The pump is placed horizontally about 25 feet in front of the steam cylinder, and in a plane 18 feet below it. The piston rod of the cylinder gives motion to the upper end of the vibrating beam, by means of a cross head and a short connecting rod, while a similar cross head and rod transmit the motion of the lower end of the beam to the piston rod of the pump. From the upper end of the beam a connecting rod also gives motion to a crank shaft and fly wheel, by means of which the motion of the engine is equalized. The pump receives its water from the river under a head of about 4 feet at mean tide, and forces it through an 18-inch pipe, 13,260 feet long, to a reservoir 118 feet above the average level of the river. The steam and exhaust valves of the cylinder are of the Cornish equilibrium variety, placed in chests at each end of the cylinder, and are operated by cams on a revolving shaft driven by bevel wheels from the crank shaft of the engine. The arrangement for varying the cut off is simple and effective. Each steam valve is opened by a roller on the end of an appropriate lever, which is depressed by a raised face or projection on a corresponding cam. The cams are so made that by moving them longitudinally on the shaft, faces of greater or less length, corresponding to different grades of expansion, are presented to the roller on the end of the valve lever. Under each boiler, in the chamber behind the bridge walls, is a supplementary boiler or heater, connected to the main boiler by wrought-iron pipes.

OBSERVED RESULTS OF EXPERIMENTS.

	Without Expansion.	*With Expansion.*
Duration of experiments	28.5	28
Total number of revolutions	21,860	26,250
Total pounds of coal consumed	21,520	16,270
Pressure of steam as per gage on boilers	38	50
Average effective pressure per square inch of steam piston, as per indicator diagram	28.5	28.5

DEDUCTIONS FROM OBSERVED RESULTS.

Revolutions per minute	12.78	15.62
Revolutions per pound of coal	1.015	1.613
Coal per horse power per hour	8.073	5.083
Coal consumed per hour per square foot of grate	3.75	2.9
Coals consumed per revolution in lbs.	.984	.619
Water evaporated per lb of coal, in lbs.	6.72	5.85
Coal saving with expansion in per centums of coal used without expansion.	....	37.03

[It will be observed that in using the steam expansively in the above case, it was 50 pounds pressure on the inch—12 above that which was used at full stroke. We regret that Mr. Birkinbine did not make experiments with steam at 50 pounds, running full stroke, because it is admitted by those who are advocates of non-expansive steam that there is a gain in using steam of a high pressure and temperature, independent of using a cut off. These experiments, therefore, are not conclusive, although they are instructive and interesting.—EDS.

Inspection of Steam Boilers in Rhode Island.

In Providence, R. I., there is an excellent association, similar to that in Manchester, England, for inspecting the boilers in that city and vicinity. The Inspector, Mr. James H. Monroe, in his report for last year states that there are 100 steam engines under the charge of the association, the average power of which is 5,150 horse. For generating steam there are 247 boilers used, of the following classes :—

Cylinder boilers	142
Flue boilers	80
Tubular boilers	22
Egg-shape boilers	3
Total	247

Mr. Monroe says ;—"There have been 12 boilers and 3 small engines stopped during the year. I have found 2 boilers unfit for use, which have been replaced by others. I found 17 boilers needing repairs, which have all been properly repaired. I find in all the boilers that I have examined the greatest cause of trouble is the large deposit of sediment and scale collecting in the boiler from the impurity of the water. I would recommend to persons locating boilers a plain boiler, of easy access to clean, as the most suitable for use generally in this city."

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THE APPLICATION OF CHEMISTRY TO THE MILITARY ART.

At the weekly meeting of the Polytechnic Association of the American Institute, on Thursday evening, Jan. 23d, the chairman announced that the appointed subject for discussion was the application of chemistry to the military art, and called upon Professor Seely to open the debate.

Prof. SEELY—There seems to be a general misapprehension in the public mind in regard to what chemistry can do in the way of killing people. We see in the papers, or hear in conversation, the statement that if it were not for our humanity we could easily suffocate an army with noxious vapors, or sprinkle them with destructive acids, or burn them up with liquid fires. All of these notions are quite absurd. We employ the most destructive agencies with which we are acquainted. The greatest service that chemistry has ever done for the military art was the invention of gunpowder. It has more destructive power than any other substance known. Compare it, for instance, with some of the acids the use of which in war has been suggested. If we throw sulphuric acid upon a person it will injure him. If a drop gets in the eye it will put the eye out. But it will not do as much damage as a shot of the same weight striking the eye. I would rather have ten grains of sulphuric acid thrown in my face than a shot weighing one grain. All this too is apart from the practical difficulty of throwing a liquid to any distance. The art of war is the most perfect of all arts. It has received far more encouragement from governments than any other, and the intelligence of all nations for thousands of years has been directed to its improvement. To provide for its various exigencies the latest developments of science are called into requisition. Explosive shells, charged with the most suitable materials known, have been carefully and thoroughly tested, and are now stored in great numbers in our arsenals. We have heard some talk about filling shells with "liquid fire," as it is called—a solution of phosphorus in bisulphide of carbon. It was said last week that this substance has been objected to from the fact that it produces sores which are difficult to heal. It is not the aim in battle to afflict the enemy with incurable diseases, but to disable him immediately. It is just as well to wound him, or to take him prisoner, as to kill him. When phosphorus is dissolved in any volatile liquid like the bisulphide of carbon, if the solution is spread out in a thin sheet, as soon as the solvent evaporates, the phosphorus, exposing a large surface to the atmosphere, absorbs oxygen so rapidly that it becomes heated to the moderate temperature (about 120°) at which it takes fire. But phosphorus in burning gives out very little heat, and will seldom set anything else on fire. Last week Dr. Van Der Weyde very kindly showed us the common and striking experiment of dipping a piece of paper into the phosphorus solution and holding it in the air. You remember that as the solvent dried away the phosphorus took fire; and you also remember that the paper was not burned. You know that upon the ends of friction matches there is a little phosphorus, and below this a little sulphur. Now, the sulphur in burning produces sulphurous acid, which is an exceedingly poisonous compound, and it would be very desirable to avoid using the sulphur. But the phosphorus will not set the stick on fire. Sulphur burns more easily than wood; the phosphorus will set the sulphur on fire, and then the sulphur will kindle the stick. I would rather have a six-inch shell, filled with melted cast-iron, to set a ship on fire with than a hogshead of a solution of phosphorus in the bisulphide of carbon.

At this moment Dr. Van Der Weyde came in from his lecture and remarked:—I was told in the hall that it had been stated here that the substance which I exhibited last week would not burn anything.

The CHAIRMAN—Will Prof. Seely please repeat his statement.

Prof. SEELY—Dr. Van Der Weyde understands the matter perfectly, and if he were going to give an account of it, it would be the same that I have given. I said that phosphorus generates very little heat in burning, and will set fire only to very combustible substances.

Dr. VAN DER WEYDE—I got a drop of the liquid on my thumb and there is a bad burn that it made.

Prof. SEELY—Yes; but it did not set it on fire.

SURFACE CONDENSERS FOR STEAM ENGINES.

Number V.

In diagram No. 10 we have views of the peculiar double condenser tubes of James M. Miller, formerly of New York, whose condenser was illustrated on page 17, Vol. VIII. (old series) SCIENTIFIC AMERICAN. The other figure representing Howden & Morton's bent tubes will be easily understood. Miller's condenser consists of a series of tubes, each double. The outer one is of comparatively large diameter, with a conical tube fixed to the inside, the smaller end being closed, and extending nearly to the mouth of the outer tube. The steam is admitted between the plates into the tubes, the water circulates around their outer surfaces.

Fig. 10.

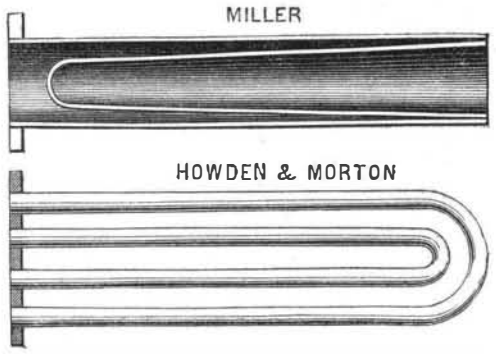
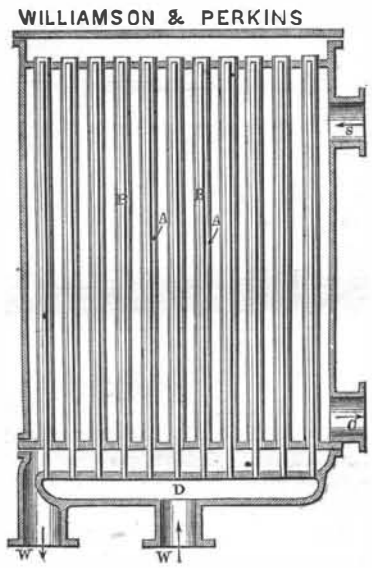


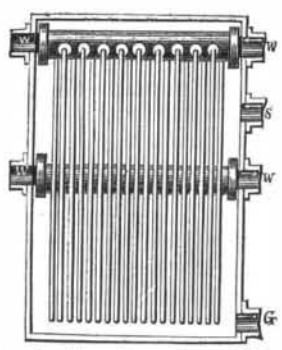
Fig. 11 represents the condenser of Messrs. Williamson & Perkins.

Fig. 11.



The exhaust steam from the boiler is admitted by the branch, S', into a cast-iron box, containing a number of tubes, A, closed at their ends, and firmly fixed into a tube plate at the lower end, being allowed to expand and contract through holes in the upper plate, which serves to keep the tubes in place. Inside these tubes are others of smaller diameter, B, open at both ends, the lower ends being firmly fixed in the dia-

Fig. 12.

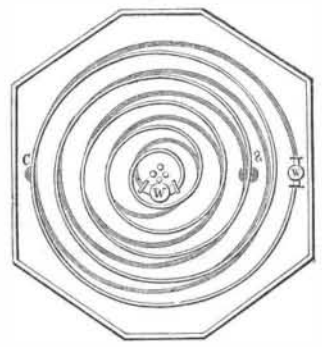


phragm of the chamber, D, and reaching nearly to the closed ends of the tubes, A. Water is admitted by the branch, W, through the chamber, D, into the tubes, B, and, passing through their upper ends, returns through the annular space between the two tubes, thus cooling the outer tubes and condensing the steam, the condensation water from which is removed by the air pump through the branch, C', and is returned to the boiler.

By an arrangement not shown in the diagram (should any leakage take place) a valve attached to the inlet branch, W, being partially closed, the circulating pump attached to the outlet branch, W', acts under such circumstances as an air pump, and causes a partial vacuum on both sides of the tubes, thus preventing the access of condensing water to the condenser. This condenser has been used with considerable success by Dr. Williamson, and possesses many advantages; first, by the condensation water having all to pass through the annular space between the tubes, must necessarily (the same quantity being used) pass much more rapidly over the surfaces than when the water fills the whole of the tubes, and thus present a large surface of water, and, at the same time, by its rapid motion, diminish the quantity of scale or sediment on the tubes. The tubes are also free to expand and contract unequally by being fixed at one end only. On the other hand, it would be very inaccessible for cleaning, and, from the double number of tubes, expensive.

The next figures, 12, 13, represent a plan patented by Messrs. Randolph and Elder, and consists of a number of alternately right and left spiral tubes, attached at one end to the top pipe, W, and inclosed in an iron

Fig. 13.



case, into which the exhaust steam is admitted through the branch, S', and the condensation water withdrawn through the branch, C', the condensing water being made to pass through the spiral tubes.

This condenser would, undoubtedly, expose a large condensing surface, and would not be affected by any unequal expansion and contraction of the tubes, but it would be expensive and difficult to manufacture, and inaccessible for cleaning.

Uses for Light Rock Oil.

Chemists who have investigated the subject of petroleum products agree that benzole is not to be found among them; and that the substance called *benzole* which is obtained from petroleum is a light eupion oil ranging in specific gravity from 650° to 750°. It is now used to some extent as a vehicle for quick-drying paints. It is very volatile and evaporates rapidly when exposed to a gentle heat. As it does not contain water, it is superior to common alcohol as a solvent for several resins that are employed in making varnishes.

Those light oils have been used successfully in several cases of rheumatic and neuralgic affections. The best method of applying it for this purpose is to saturate a piece of cloth or paper, and bind it to the part affected by several thicknesses of cloth, to prevent too rapid evaporation, and continue the application as long as the patient can bear it. A short time after its application a pricking, burning sensation will be experienced, which should be borne as long as possible, and the application then removed. The pricking soon subsides, and the application, if necessary, should be again repeated. No vesication or eruption will be caused by its application; only a slight redness of the skin, which soon disappears.

EXTENT OF THE GULF STREAM.—The Swedish government last year sent a scientific expedition to Spitzbergen. It has just returned to Troruss, whence it started, after having accomplished its mission very satisfactorily, in spite of the rigor of the weather. The old maps have been corrected; fresh ports have been discovered and numerous experiments made, which have thrown fresh light on meteorology and natural history. It has been ascertained that animal and vegetable life exists in the sea at a depth of 2,500 yards, and that the great current of the Atlantic Ocean, known by the name of the Gulf Stream, reaches as far as the coast of Spitzbergen, pieces of broken wood, bottles, &c., having been found there.

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Correspondence

How to Pass a Fleet over a River Bar.

MESSRS. EDITORS :—I was just reading an account of the naval expedition down the coast, and that it was to enter the waters of Pamlico Sound, where there was some difficulty expected in passing over the bar, as the water was represented to be only eight feet, while most vessels drew a great deal more. I suggest the following mode for crossing bars :—Let the steamers—say half dozen or more—be lashed together, one immediately behind the other, and advance slowly to the bar, the hindmost one throwing a small anchor over the stern as soon as they enter the soft mud. By holding the boats thus, and keeping the wheels in motion, the soft mud will be drawn from the first boat to the next, and so passed along until it is thrown behind the last in deep water. As the way is cleared the boats can be moved ahead slowly, so as not to compress the soft mud under the bow of the first. In this way, I think, the difficulty can be overcome. I will simply state my reasons for thinking so. I was one of a party, in the fall of 1828, passing from Great Egg Harbor to Little Egg Harbor, and when we came to the bar, the tide being down, six of us could not row our boat through, although we could move the mud quite freely with our oars. I proposed that we should rock the boat gently, at the same time using our oars as paddles, close to the side of the boat. In this way we progressed, and in a short time we were over. J. P.

Dayton, Ohio.

The Motion of Rockets.

MESSRS. EDITORS :—The writer, "Civil Engineer," of an article under this head, in the SCIENTIFIC AMERICAN of Jan. 18th, makes an intricate question of the matter by quoting prominent scientific names on the subject, and concluding by expressing his own opinion that the cause of a rocket's motion is by the resistance of the atmosphere to the issuing gas, and that "it is doubted whether a rocket would ascend at all in a vacuum."

In reply, if a cylinder containing steam, or other gas, be surrounded by air, compressed to the same density, there would be no tendency in the gas to burst off the end, and if the end were removed by some means foreign to the cylinder there would be no tendency to motion. But if the density of the surrounding air be lessened the inclosed gas would besome available to give motion, in proportion to the density of the air, and, when in a vacuum, the action would be perfect.

The above writer alludes to the impossibility of propelling a steamboat by an opening in the rear end of the boiler, and conceives his argument strengthened thereby, which is not apparent. However, this is not theoretically impossible, and a speculative paper on the subject was forwarded by me to the *Franklin Journal* about the year 1843-4, at which period I was an occasional contributor.

If the tube leading aft from the boiler were protected from losing heat, and of such (impractical) length that the steam at the end should have expanded down to atmospheric pressure, we should have an efficient and economical steam engine. T. W. B.

Cincinnati, January, 1862.

A Question in Relation to Steam.

MESSRS. EDITORS :—Will you please state your views upon the following through the columns of your paper :—I have a steam heater, consisting of an iron cylinder, inclosed in a jacket, also of iron ; the article to be heated is placed in the cylinder, and steam admitted between the cylinder and jacket ; there is a safety valve on the heater, weighted 10 pounds to the inch ; also, a pipe to admit steam, and one from the bottom to carry off the water of condensation. Both the pipes have throttle valves, so as to keep the pressure at about what the safety valve will hold down, viz., 10 pounds per inch. Under certain unfavorable circumstances the heater will not heat fast enough, and the question is, will it heat more rapidly if the pressure in the boiler is raised from 40 pounds (the present pressure) to 50 or 60 pounds per inch—the steam after passing into the heater of course falling down to 10 pounds, the highest pressure admissible there? J. J. B.

Burlington, Iowa, Jan. 18, 1862.

[Steam at 10 pounds pressure must always be at a temperature of 240°, provided it is heated through the water; but if our correspondent will carry his pipe through the fire, so as to superheat his steam, he may have his steam at any temperature that he pleases with a pressure of 10 pounds to the inch.—EDS.

Making Core Boxes for Casting.

MESSRS. EDITORS :—The following is a description of a method which I employ to obtain core boxes for small castings. By the mode described, the form of the cavity intended for the core is very exactly and easily obtained. I will endeavor to make it intelligible by describing the mode of making a core box for the core of a tube, two inches in length and one-half of an inch in diameter. I screw together near their ends, two pieces of wood, four inches long, one-half an inch wide and one-quarter of an inch thick. Centering it at the joint I turn the united pieces to within one-half an inch of each end, that is to say, three inches of the same, down to the diameter of the tube (one-half of an inch), and cut off the unturned ends, all of which is explained by the figure below, A B between the dotted lines being the space representing the part turned. I then lay one of these half-round pieces on a smooth board, flat surface down, and upon it I lay a flask of the same length, namely, three inches, one inch wide and three-quarters of an inch deep, as represented by figure 2. Having oiled

Fig. 1

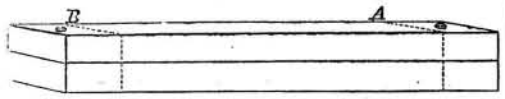
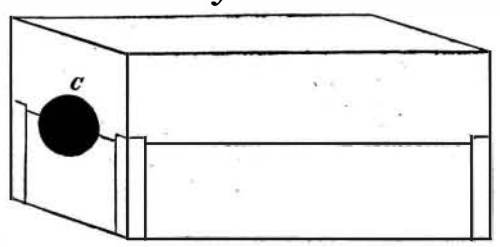


Fig. 2



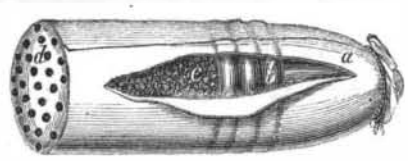
the upper side of the pattern I fill the flask with fluid plaster of Paris. When this has hardened I remove the flask and lay the other half of the pattern on the half imbedded in the plaster, and on it place another flask of the same dimensions as the first, and like it, having semicircular notches in its ends to fit the pattern. After oiling the surfaces of the pattern and of the first cast of plaster, I fill the second as before with fluid plaster of Paris. When this latter cast has hardened, I separate the two flasks, and removing the pattern from each they form the core box (adjusted by means of splints upon the sides and ends) in which a core can be molded, as at C, of sufficient length for the tube and for half an inch to support each end in the sand mold at the foundry.

Other shapes than circular may be obtained by the same method, which will often save much time, produce an improved core box and facilitate its manufacture. T. M. COFFIN.

Plymouth, Mass., Jan. 11, 1862.

RICHARD'S IMPROVED CARTRIDGE.

The powder for loading muskets for use in the battle field is always measured out in quantities sufficient for a single charge, which is inclosed in a paper wrapper and attached to the bullet, the whole forming a cartridge. In loading, the soldier bites off or opens the end of the cartridge, so that he may pour the powder into his musket, after which he drives down the ball and the paper of the cartridge with his ramrod. The biting of the cartridges often produces serious injuries. In the first place it makes the mouth very dry, causing in long battles extreme thirst. The powder is apt to make sores in the mouth, and is very injurious to the front teeth ; not unfrequently disabling the soldier for the performance of his duties. These inconveniences have long been recognized by army officers, and many efforts have been made to devise a cartridge which would not require to be bitten in loading, and several contrivances have been invented for cutting off the cartridge. The annexed cut represents one of the latest of the plans of forming a cartridge to obviate the necessity of tearing the paper at the end of the cartridge with numerous holes, so that the flame from the percussion cap may reach the powder without having the paper torn. To



show the construction of the cartridge it is represented with a little slit in the paper. The paper, *a*, beyond the base of which it extends a sufficient distance to form a receptacle for the powder, *c*. The end, *d*, of the cartridge is perforated with holes which are two small to permit the escape of the powder, but which will readily admit the flame from the percussion cap.

Application for a patent for this invention has been made, through the Scientific American Patent Agency, and further information in relation to it may be obtained by addressing the inventors, T. C. Richards, at Milwaukie, Wis.

THE CHEMISTRY OF COAL.

Number III.

THE THREE SERIES.

The substances resulting from the destructive distillation of coal vary with the temperature at which the distillation takes place. There are three series of these substances, each series the result of a peculiar distillation, which are at the present time occupying a large share of the attention of the civilized world. The first is formed in making illuminating gas, the second in the manufacture of coal oil, and the third constitutes petroleum or rock oil. Illuminating gas is produced at a bright cherry-red heat, about 1,400° Fah., coal oil at a temperature of 650° to 700°, and petroleum under conditions which have not been ascertained.

Of these three series only one has received any considerable examination—the series formed in the manufacture of illuminating gas. Coal oil, illuminating gas and petroleum are all composed of mixtures of various hydrocarbons. Hydrogen and carbon combine with each other in a great number of proportions, far greater than any other two elements, forming a corresponding number of substances varying very materially from each other in many of their properties. There is no class of substances in nature more interesting than the hydrocarbons, and as the production of these is the primary object in the distillation of coal, we propose to give considerable space in these articles to their examination, and as those produced in the manufacture of gas are the only ones that have been investigated, our attention must be confined to them. We shall reserve their examination for our next article, merely remarking at this time that they differ from the hydrocarbons which constitute either coal oil or petroleum. For instance, one of the most interesting and valuable of all the hydrocarbons in the coal-gas series is benzole. It is not only applicable to a variety of uses when isolated, but it is the substance from which the brilliant dyes solferino, magenta, &c., are made. There is a volatile hydrocarbon in petroleum, assimilating benzole in some of its properties, but it is not benzole, neither is there any benzole in coal oil, if the retorts are kept at the usual low temperature of 650° to 700° during the distillation. In our next article we shall describe briefly the mode of distilling coal for the manufacture of gas, and shall afterward proceed to an examination of the products.

AN INVENTION OF THE CAMP.—We have in our possession a very clear working drawing of a firearm invented in the camp of one of the New York regiments. The drawing was not only done in camp, but the drawing pen with which it was executed was made there also from a piece of sheet iron obtained from the armorer of the regiment.

A COMPANY with a capital of $250,000 has been formed in England for cultivating cotton in Queensland ; another with a capital of $1,000,000 for cultivating cotton in Venezuela, and another, with a capital of $250,000, for cultivating it in Natal.

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Binks's Experiments on the Constitution of Steel.

The following is Muspratt's account of Mr. Binks's experiments on the constitution of steel, alluded to in an article on our editorial page :—

Mr. C. Binks, in a series of interesting experiments upon the manufacture and true composition of steel, has advanced suggestions of very great importance. His experiments were conducted upon iron, submitted to different reagents, at a full red heat, as in case hardening, or in the cementation process. His results were as follow :—

1. That a small rod of iron packed in boxwood charcoal, in a closed porcelain tube, and kept at a full red heat for twelve hours, did not, after being tempered, show a hard steel surface, nor did it exhibit, under high and different degrees of heat, the play of colors peculiar to real steel. It still remained malleable iron.

2. But when atmospheric air is admitted to such an arrangement, in such quantity only as still to keep the carbon in excess, then, in the first instance, the surface of the iron, and, finally, if the time of contact be long enough, the whole of the iron is converted into steel.

3. That the application to the iron of nitrogen gas does not produce steel.

4. That neither does the application of carbonic oxide give steel.

5. That the application to the iron of a hydrocarbon—as when olefiant gas is passed through the tube, or when the red-hot rod is dipped into oil containing no nitrogen—does not produce steel.

6. But that the application of olefiant mixed with ammoniacal gas, or the application of gaseous cyanogen, produces steel, as does also the dipping of the hot metal into a nitrogenized oil or fat.

7. That the application of ferrocyanide of potassium, as has been so long known, gives steel.

8. That equally with the ferrocyanide does the application of simple cyanide of potassium result in the production of steel ; therefore, it is not to the iron contained in the ferrocyanide that the steel-making property of the latter salt is due.

9. That potassa applied to the hot iron, or the keeping the hot iron in the vapor of potassium, does not yield steel.

10. That with iron of the kind that has so far been referred to and used, *id est*, commercially pure wrought iron, containing no material proportion of carbon, the application to it of ammoniacal gas, or of nitrate of ammonia, fails to produce steel.

11. But that the application of ammoniacal gas or chloride of ammonium to iron containing a considerable proportion of carbon, ninety-five to five, results in its conversion into steel.

These results tabulated, and the composition of the reagents expressed in chemical formula, will better exhibit the inevitable deductions to which they lead :—

1. Fe+C—in excess, every other element excluded.....leaves iron.
2. Fe+C—in excess+atmospheric air ...gives steel.
3. Fe+N—nitrogen.....leaves iron.
4. Fe+C O—carbonic oxide.....leaves iron.
5. Fe+H_4 C_4—olefiant gas.....leaves iron.
6. Fe+H_4 C_4—in excess+NH_3—ammoniacal gas.....gives steel.
7. Fe+N C_2—cyanogen.....gives steel.
8. Fe+K_2 Fe Cy_3—ferrocyanide of potassium.....gives steel.
9. Fe+K Cy—cyanide of potassium.....gives steel.
10. Fe+KO—potassa.....leaves iron.
11. Fe+K—potassium.....leaves iron.
12. Fe+NH_3—ammoniacal gas.....leaves iron.
13. Fe+N H_4 Cl—chloride of ammonium. leaves iron.
14. $\frac{Fe+C}{95\quad 5}$+N H_3—ammoniacal gas.....gives steel.
15. $\frac{Fe+C}{95\quad 5}$+N H_4 Cl—chloride of ammonium.....gives steel.

The conclusions drawn from these experiments are thus stated by the author :—

That the substances, by the application of which to pure iron it is converted into steel, all contain nitrogen and carbon, or nitrogen has access to the iron during the operation.

That carbon alone added or applied to pure iron does not convert it into steel.

That nitrogen alone so added or applied does not produce steel ; but that it is essential that both nitrogen and carbon should be present, and that no case can be adduced of conversion in which both of these elements are not present and in contact with the iron.

That both nitrogen and carbon exist substantially in steel after its conversion ; and the presence of both is the real cause of the distinctive physical properties of steel and of iron, in which latter these elements do not exist.

That presumptively, but not demonstratively, the form of combination is not that of cyanogen—though that compound plays so important a part in conversion—but is that of a triple alloy of iron, carbon and nitrogen.

Lastly, that experimental research is yet required to determine the relative proportions of the elements when their union gives pure steel.

The reader will perceive that these investigations and their results are deeply interesting, and throw an entirely new light on the composition of steel. May not the nitrogen take the place of that portion of carbon which is eliminated from the cast iron during the process of its conversion ?

Cotton and Sugar at the West.

The Commissioner of Patents, in a circular just issued states that the cultivation of cotton in the milder portions of the free States is beginning to attract general attention. To prevent failures in its cultivation, it is proper to remark that it is a principle in vegetable physiology that tropical plants can never be acclimated North except by a repeated reproduction of new varieties from seed. The attempt to grow Sea Island cotton, such as is now brought from Hilton Head, would prove a failure in any portion of the free States. The only variety capable of successful cultivation in those sections now seeking its introduction is the "green seed" cotton, such as is now being raised extensively in Arkansas, Missouri, Tennessee, and portions of Kentucky, and which produces the "white fiber." Seed should be obtained from these localities. The modifications of soil and climate will influence the size of the plant, the length and fineness of the fiber, and the product of the crop. No reasonable doubt is entertained of the success of the culture in all mild portions of the Middle States, and efforts are now being made to procure the proper seed for distribution.

The results of the cultivation of sorgho the past year settle the question of its entire practical success. The value of its product is now counted by millions, and its cultivation is becoming a subject of absorbing interest. One of the difficulties presenting itself is the want of pure seed. To meet this want the Patent Office has ordered seed from France for distribution the ensuing spring. It must be borne in mind, however, that the same causes which has produced deterioration here exist there, and well-grounded apprehensions are entertained that the seed thus imported may not be free from suspicion. Farmers interested should secure pure seed from among themselves when it is possible, as the season is so far advanced that direct importations from Africa or China would be impracticable,

A correspondent of the Philadelphia *Ledger* remarks respecting the cultivation of cotton North :—

The Southern shore of Lake Erie possesses an altogether peculiar climate. A strip of land about sixteen or twenty miles in width, adjacent to the lake and extending almost across the State of Ohio, has its temperature very much modified by the influence of the large body of water north by which the northern winds are greatly tempered. A distinguished naturalist who resided for many years at Cleveland, observed that both animals and plants were found in this belt of land which belonged further South than even Cincinnati. A short distance in the lake is found Fisher's Island, which is now the best place in the United States for the culture of the grape.

Whether or not this shore region is adaped for cotton culture can only be determined by actual experiment, and I trust it will be made this coming season.

A region suitiable for the cultivation of the vine may not be adapted for the cotton culture. Early frosts are the great drawback to the raising of cotton. It is a plant which is almost as tropical in its character as the orange. It is stated that there is a species of cotton raised in Japan, in sections on the same line of latitude as Southern New York and New Jersey. Probably this variety may be cultivated with success in the Middle States.

No less than 27,000,000 cubic feet of timber are imported annually into Great Britain. Most of this comes from Canada and the United States.

Dividends of Manufacturing Companies.

The following is a table of semi-annual dividends on the manufacturing stocks of several leading New England corporations :—

		Dividends.		Amount.
		July.	Jan.	Jan.
Manufacturing Companies.	*Capital.*	1861.	1862.	1862.
Appleton	$600,000	4	6	$36,000
Bates	800,000	5	6	48,000
Chicopee	420,000	0	6	25,200
Cocheco	2,000 shs.	0	$25	50,000
Douglas Axe	300,000	3	3	9,000
Dwight Mills	1,700,000	2	4	68,000
Franklin	600,000	3	4	24,000
Great Falls	1,500,000	3	4	60,000
Hill (Lewistown, Me)	400,000	5	5	20,000
Hamilton Cotton	1,200,000	0	6	72,000
Jackson	600,000	3	5	30,000
Lancaster Mills (par 450)	2,000 shs.	$13½	$12	24,000
Lowell Bleachery	300,000	5	5	15,000
Manchester Print Works	1,800,000	3	4	72,000
Middlesex	500,000	5	5	25,000
Nashua	1,000,000	3	5	50,000
Naumkeag	700,000	5	4	28,000
Newmarket	600,000	3	4	24,000
Pacific	2,425,000	3	4	97,000
Portsmouth Co	183,200	3	5	9,160
Salisbury	750,000	5	10	75,000
Salmon Falls	1,000,000	2	4	40,000
Stark Mills	1,250,000	3	5	62,500
Washington Mills	650,000	—	3	49,500
Total				$1,013,360

The stocks here enumerated represent a capital of $25,000,000. The half-yearly dividends amount to upward of $1,000,000, averaging fully 8 per cent per annum. The amount of dividends paid on the same stocks last midsummer was only $617,900.

Sorghum in Wisconsin

The Wisconsin *Farmer* says :—We have favorable reports of the sorghum crops of the past season. The opening of the war and the certainty of advanced prices had the effect to stimulate the farmers, and the result appears to have been an increased supply of sorghum molasses. As appears by the statistical returns, the number of acres planted in 1860 was 318 85-100, yielding a product of 51,135½ gallons of molasses and 3,493 lbs. of sugar. Last year the crop must have been considerably larger than this, though we have not sufficient data for a safe estimate. We have never believed that sorghum would come to be a great staple crop in our State, but the success which has attended its cultivation on a small scale should be an encouragement to more of our farmers to cultivate it for their own use. Next season we shall expect a much larger crop than ever before.

Prince Albert.—It is observed by *The Atheneum* that the knowledge of the Prince Consort was very great, and it lay in many unexpected nooks and corners. Of music he knew far more than an average man—played on more than one instrument—sang well—and wrote down his thoughts in musical works of some length—if not with high creative power, yet with a steadiness and sensibility not to be found in the works of ordinary gentlemen who write. It is known to the public that he was a very good etcher. "We have heard an engineer declare that the Prince knew more of fortification than any non-professional person he had ever met ; and the Secretary of the Photographic Society assures us he was a very admirable photographer."

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World's Fair Agency.—Our readers will notice the advertisement in another column of G. H. Sanborn, of Boston, in which he proposes to become an active agent for American exhibitors. We remember Mr. Sanborn at the Great French Exhibition of 1855, and regard him well qualified to meet all the wishes of our countrymen at the approaching London Exhibition.

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FORTUNES AND MISFORTUNES OF AN ARTIST.

Many of our readers in Washington, Baltimore, New York and Philadelphia, remember the famous Root daguerrean gallery, on Chestnut street, in the last-named city, which flourished most about the year 1850, when the art was comparatively in its infancy. Since that period the art has yearly improved, and many hundreds who once admired the sun pictures so skillfully taken at the Root gallery have departed this life, while as many others now living have, no doubt, forgotton the pleasant, kind-hearted gentleman who was ever in attendance at the gallery, ready with his pleasant countenance to greet a new customer. That gentleman was M. A. Root, the proprietor of the art gallery, and after whose name it was then called and so credibly known. A few years ago we lost sight of the famous operator in Chestnut street, and, until the other day, we knew not what had become of him, but supposed that, like others in the profession, he had amassed a fortune and had retired from business, to enjoy the fruits of his industry, when, one day, we came across a neatly-printed circular, from which we extract the following :—

M. A. Root would respectfully inform his friends, his former patrons and the public at large, that after nearly five years' suspension of his professional labors he has returned to the practice of Heliography in all its branches, and may be found at No. 953 Broadway, and No. 183 Fifth Avenue, opposite Fifth Avenue Hotel, New York, prepared to execute pictures in every mode and style of the art, and with all the latest improvements. Many may be aware that this long inaction was caused by a terrific rail road collision, from which escaping barely with his life, he received injuries so severe that indescribable and protracted sufferings were the result, and he must carry tokens of them even to his grave. His health and strength, however, being at last restored to a degree fully adequate to all the demands of his profession, he now returns to the practice of an art which, for twelve years prior to his casuality, he had cultivated with enthusiastic zeal.

We afterward called at the gallery, between Twenty-second and Twenty-third streets, and solicited from Mr. Root an account of his early life, and a statement concerning the casuality to which his advertisement briefly alludes. He being one of the oldest, and at one time the most popular operator in the country, we think the following short history of his life, successful career and misfortune will not fail to interest all his old personal friends, as well as the profession to which he belongs.

M. A. Root was born in Granville, Licking County, Ohio, August 15, 1808. His parents emigrated to that place, then an untracked forest, from Westfield, Mass., in 1807. The subject of this sketch who was by temperament, industrious, sober and regular, remained at the parental home until his twentieth year, taking his full share of the severe toils of this wilderness farm. But, notwithstanding his incessant and fatiguing labors, and the absence of all appliances and incitements to the culture of art, the native genius of the boy manifested itself, as has happened thousands of times before, by a propensity to sketch the faces of persons, animals or objects coming in his way.

Thus passed the life of young Root until 1827, when his father sent him to the Ohio University, in Athens, Ohio. He entered the University, and committed the mistake so common with ambitious youths; he studied intensely, while he omitted to take a moderate share of physical exercise at regularly-recurring periods, substituting for this violent fits of exercise at remote intervals. As a consequence his health became undermined, and he was obliged to leave the school. So soon, however, as he was able, he took to his favorite employment, and, with his pencil, sketched first the faces of his father's family. His success encouraged him to hope that he saw an opening for the future. Opportunity occurred for taking portraits in adjoining towns. Becoming thus favorably known, he visited Columbus, the State capital, and there passed the winter of 1830–31, employed in sketching the members of the Legislature, and citizens of the place.

Finding, while resident here, a writing master of celebrity, he took evening lectures of him in addition to his sketching occupations by day. The result of this two-fold work was a second attack of pleuresy, which came upon him while stopping in Worthington a few miles from Columbus. There he was confined from February to September before he could return to his father's house, twenty-eight miles distant. After his recovery he resumed his pencil, and, at the same time, taught writing schools in the evenings; and, after a while, added to these two employments a third, that of copying engravings with the pen, a work which he executed with extraordinary skill. The dexterity and taste displayed in these various arts, gained for him an extended and enviable reputation, especially as he had been from the outset entirely self-taught, and possessed of few advantages. He was, in consequence, strongly advised to visit New York or Philadelphia, and place himself under the instruction of Inman or Sully. Accordingly he came, in August, 1833, to Philadelphia, and consulted Mr. Sully, who spoke discouragingly of painting as a profession, suggesting that all artists were poor, and that, if he became one, he would inevitably be doomed to much suffering in mind, body and estate. He then counselled Mr. Root to make the teaching of penmanship his vocation, stating that he could do more good and secure more thanks, as well as more dollars for his labors.

Such suggestions from so high authority weighed upon the young man's mind so forcibly as to alter, at least for the time, his plan of life. Accordingly, by the solicitation of friends, he was induced to commence teaching penmanship in Wilmington, Chester, Woodbury and other places in Pennsylvania, up to the year 1835, when he commenced private classes in Philadelphia, and assumed the charge of the writing department in several of the city schools. He continued thus occupied until 1846, and, meanwhile, prepared and published an admirable series of writing books, which had an extended sale.

In 1846 circumstances served to awaken, in a novel form, his old love of art. A daguerrean gallery, at the corner of Fifth and Chestnut streets, in Philadelphia being for sale he purchased it of J. E. Mayall, the now-celebrated photographer to the Royal Family, London, and there commenced the business of sun painting. At that time there were but five practitioners of the art in the city, and daguerreotyping was regarded by the public generally not so much as an important art, destined to become general, as an ingenious and beautiful novelty. And even by its practitioners, not less than by the public, it was esteemed little else than a mere mechanical operation, requiring simply a manual aptitude and dexterity, and not artistic genius and acquirement. The fallacy and gross wrongfulness of these views Mr. Root directed his efforts to expel, and succeeded in making his new vocation respectable, popular and remunerative, and to give it an approved place and name throughout the country, at the same time that he carried the art itself to the highest attainable point of perfection. In these endeavors he spared no needful expense, and in the course of a few years devoted to building up his business upward of $25,000. He availed himself of every practicable means of attracting the popular attention to his art. Thus he took careful views of public edifices, public processions and demonstrations, &c., and embraced every opportunity accorded him for obtaining the portraits of distinguished individuals, such as statesmen, military men, clergymen, lawyers, artists, actors, scientific and literary persons, &c. These productions were generally noticed editorially by the city press, and often by distant papers, besides being liberally advertised by himself at a heavy expense. The design of all these measures was to popularize the art by drawing general attention to its productions. The result of this course of Mr. Root was to augment very soon the number of city practitioners from five to above one hundred. As an indirect effect of the same causes the daguerrean operations in the United States swelled from a few hundreds to the number of ten thousand. Another of the plans resorted to by Mr. Root was to exhibit skillfully prepared pictures at the annual Fairs held in New York, Boston, Philadelphia and elsewhere. At these exhibitions eighteen medals and several diplomas were awarded him for the superiority of his heliographic specimens.

Mr. Root's natural love for the art and his enthusiastic and protracted study of publications upon the subject, had thoroughly acquainted him with the characteristics most important to a portrait and the most essential points to be aimed at in attempting the representation of his subject; *e. g.*, the best view of the face and the best posture of the person; the disposition of light and shade calculated to produce roundness and relief; and more especially the most intelligent and genial expression of the sitter's individuality or self-hood.

It has already been mentioned that he was ever occupied with endeavors to improve the art. These endeavors embraced his individual experiments and his interest in and aid to the experiments of others. Thus, in regard to the supposed discovery of a method of daguerreotyping in the colors of nature, or chromatography, he exhibited his habitual interest in the subject by an expenditure of time and labor in the encouragement of the project, for which he was never pecuniarily remunerated. So also to perfecting and popularizing the photograph and ambrotype he devoted much time, great toil and large outlays of money. He furnished more articles upon his art, which were published in the *Photographic Journal*, than any other American.

We have thus intimated, in a summary way, the nature, variety and magnitude of Mr. Root's exertions in behalf of the heliographic art in its several species. From this account it appears that from very childhood his life had been more or less given to art in general, till a concurrence of circumstances in 1846 having directed his attention to heliography, the twelve following years were given to this with a zeal and a success to which this country probably furnishes no parallel. The advance of the art rather than its pecuniary results had been his paramount object during this period. The time, however, had come for seeking some pecuniary compensation for what he had done and expended in this art. At the close of the year 1856 he sold out his establishment in Philadelphia, and commenced fitting up another establishment in New York, under auspices which could hardly have failed to achieve him a successful business. A few days prior to the time appointed for commencing his new enterprise he set out for a short visit to Ohio. While on his journey he became the victim of a railroad collision, from which he now suffers and which has rendered him a cripple for life. Nine persons were rent into fragments and seventeen were more or less severely wounded, and a friend with whom Mr. Root was conversing at the moment was instantly killed. After all the dead and injured within view had been removed, some motion was noticed in a mass of rubbish lying near, chiefly of splintered boards and timbers; for in the collision the reception room of the station house in which these friends were waiting for the train, was utterly demolished. This pile being removed, Mr. Root was found beneath it most frightfully mutilated, lying upon his left leg with his foot by the side of his face. He was removed to a settee, but his case being considered so hopeless that all the other wounded were attended to before his injuries were specially examined. This was twenty-four hours after the collision, during all which time he had lain unconscious, and it was the agony of the surgical ministrations that restored his senses. For upwards of four months he was unable to move a limb; the bone of one leg being crushed from hip to knee, and there were other injuries scarcely less severe. To the physical agonies of these long, long months must be added the mental distresses arising from his absence from his family and the thought that his new business plans were being thwarted. At last he was able to reach his home, but for several months he was too feeble even to take a short ride, and it was still longer before he could walk the distance of a square without the assistance of two crutches.

Meanwhile, through the long painful hours of the day, and the still more painful hours of the night, his mind was tortured by thoughts that would intrude on all he had lost and was daily losing; by doubts whether he would ever regain health and vigor to resume the business of life, and by the soon-discovered certainty that, if he recovered, he must be a life-long cripple.

A loss of five years' probable profit by the practice of a first-class heliographer, added to the expense attending such a long sickness, and the reader can readily conceive that Mr. Root's pecuniary loss from his calamity must be very large. No compensation can be made him for the years of suffering he has endured. But compensation for pecuniary losses is possible, and we trust residents of this city and other places, who have occasion to patronize a skillful photographic artist, will not fail to give the unfortunate subject of our sketch their patronage. Mr. Root may be found in constant attendance at his new gallery, No. 953 Broadway, New York city.

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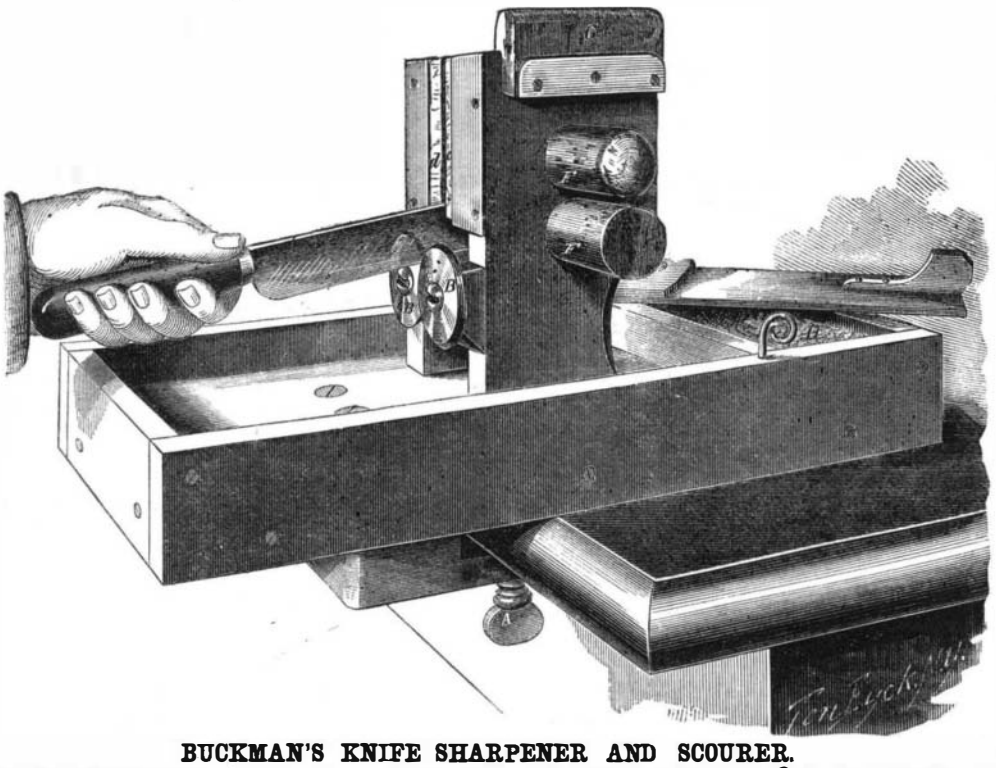
Improved Knife Sharpener and Scourer.

The accompaning engraving represents a useful kitchen implement, which will be found of daily convenience in every well regulated household. It is an instrument for sharpening knives, and for scouring knives, forks and spoons, and is operated as follows:—

By the thumb-screw, A, it is readily attached to the edge of a table when the several parts will all be found in a convenient position for use. The knife is sharpened by drawing its edge between the two hardened steel disks, B B. Two flat pieces of cork, *e* and *d*, are pressed together by a spring placed behind the piece, *d*, and the blade o the knife by is polished passing it back and forth between these pieces; dry emery or rotten stone being dusted upon them. The cylindrical cork, E, with the plane end is for the flat portions of forks and spoons, and the rounded end of the cork, F, is for the bowls of spoons, while the tines of forks are secured by being rubbed between the two corks, E and F. The cork, G, presents a surface of a different form still for other utensils. The box, H, is for the scouring powder



BUCKMAN'S KNIFE SHARPENER AND SCOURER.

The manifest advantages of this implement are the compact and convenient positions of the various surfaces to fit all parts of the several utensils to be scoured, and the cheapness at which it can be made.

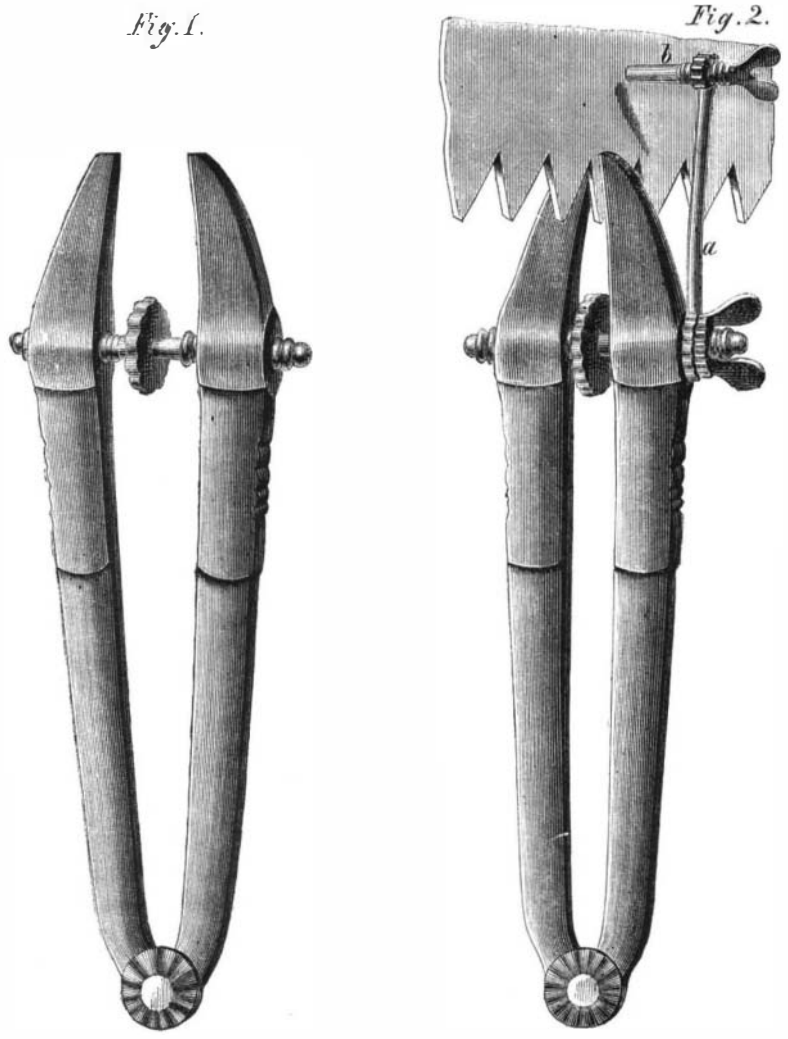
Application for a patent for this invention has been made through the Scientific American Patent Agency, and further information in relation to it may be obtained by addressing the inventors, E. and A. Buckman, at East Greenwich, N. Y.

Improved Wrench and Sawset.

The invention here illustrated is pretty certain to prove a profitable one, from the combination of two implements into one which, when upon an article of general use, always insures success; first, it is a good thing; and secondly, it is being well managed. It is a convenient, simple and cheap wrench, such as is wanted by every blacksmith and carpenter and nearly every farmer in the country; and Mr. Clizbe, who has taken an interest in the invention, is a man of indefatigable energy and perseverance, who could make an inferior invention profitable. The first money that he sent to Washington was misappropriated by his agent, and Mr. Clizbe, after waiting nine months, visited Washington and found that no step had been taken to secure his patent. In the meantime a rival application had been made, between which and the subject of this patent an interference was declared. Mr. Clizbe's application was rejected, but he followed it up, persevering after repeated rejections, till he finally obtained a patent covering all the points he desired.

This wrench was invented by Ruel Rawson, a practical blacksmith, for the purpose of turning nuts on plows, which he found it difficult to turn by means of a monkey wrench; and it will be found serviceable in many places where no other style of wrench can be employed.

It is so simple and so clearly represented in Fig. 1 of the engravings as scarcely to require a description. Two jaws of wrought iron, malleable cast iron or steel, are hinged together at one end, while their distance apart at the opposite end is adjusted by a right and left-hand screw passing through them in their widest part. It will be seen that this form of construction gives remarkable strength to the wrench; the screw braces the two jaws where the greatest strain comes, while the handle ends, being joined together by the hinge, combine the strength of both. It is impossible for the united strength of two men to bend or break one of these wrenches of moderate size.



RAWSON'S PATENT WRENCH AND SAWSET.

Fig. 2 represents the wrench with a gage attached to form a saw-set. Upon one end of the wrench sc ew is secured by a nut the rod, *a*, which has the screw, *b*, passing through its upper end. This rod and screw form the gage by means of which all the teeth may be bent at the same angle from the plane of the blade. By turning the screw, *b*, this angle may be varied for a wide or narrow set as may be desired.

The ownership of this patent is divided between James Clizbe and the inventor. Mr. Clizbe owns the right to all the Northern States lying east of the west line of the Ohio, with Kentucky, North and South Carolina, Virginia, Maryland and Delaware in the Southern States. Persons wishing to purchase rights or to act as agents in any of this territory will please address him at Quincy, Mich.

The right to the remaining portion of the country belongs to the inventor, Ruel Rawson, who may be addressed at the same place.

Rock Oil in England.

Mr. Alexander Macrae, oil and produce broker, of Liverpool, in a circular, dated 16th December, says:—

The introduction of petroleum, kerosine, photogene, or rock and well oil, is making tremendous strides, though it does not surpass the prediction in my first circular, viz., that it would be second only in extent to cotton. I will even go a step further, and venture to assert that if the rocks and wells of Pennsylvania, Canada and other districts continue their exudation at the present rate of supply, the value of the trade in this oil may even equal American cotton. Montreal (internally, and likely externally by this time,) is lit with the white refined, and I can see no reason why London and Liverpool should not also be, for the oil gas distilled from the raw petroleum is immensely superior, and much more brilliant than our own coal gas. For years we have sent coals to America for gas works, and it will be a singular freak of events if she and Canada should now supply us with a better expedient. Invested interests will, perhaps, stay it for the moment, but will they ultimately? In my first circular it was stated that some 7,000 barrels of crude and refined were on the way to this country, and the London *Times*, of the 13th ult., mentions 8,000 barrels on the way to London. There are 10,000 barrels coming to Liverpool, and 2,000 barrels to Glasgow, in all about 20,000 barrels (worth £100,000 sterling, and the trade not six months old), a simple tithe of what we want; American hostilities and the ice in the St. Lawrence (although we have still St. John's, New Brunswick,) may stop supplies to some extent, but I have no doubt the future will vindicate the expectations I have so frequently expressed.

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VOL. VI. NO. 6.....[NEW SERIES.].....*Eighteenth Year.*

NEW YORK, SATURDAY, FEBRUARY 8, 1862.

OUR WOOLEN MANUFACTURES.

So great has been the demand for army woolen goods, such as cloth, flannel and blankets, that all the woolen mills in our country have been stimulated to prodigious efforts in order to supply the demands made upon them. Most of the factories have been engaged on army contract work, and it is stated that all the corporations have made handsome profits. One peculiar effect of the war has been a great rise in the prices of the coarser qualities of wool, while the finer sorts have been lowered. The army regulations specify that common army cloth shall be made of a *long* coarse staple, hence the great demand for this class of wool has raised it to a very high figure. Thus the coarse Beckwell wool which used to sell at from 25 to 35 cents per pound has advanced to 38 and 45 cents. The consumption of wool for army purposes during the past six months has amounted to no less than 15,200,000 pounds. This allows for an overcoat, blanket, coat and pants, unitedly weighing sixteen pounds for 950,000 suits.

The army regulations requiring wool of *long* staple are wise, because long wool produces the best cloth for wear, but if fine wool can be obtained of sufficient length, and at a moderate price, it is unwise to restrict the regulations to long *coarse* wool, as the finer quality is warmer, more pleasant to wear and, when the thread is properly twisted, it endures longer. We advise those who have charge of the army clothing departments to give this subject their serious attention.

Although the army regulations specify that the cloth, blankets and flannel shall be made of long new staple wool, it has been publicly asserted that great quantities of shoddy goods have been foisted upon the United States authorities in the supplies that were furnished for the early volunteers. Shoddy consists of old woolen rags reduced by machinery to as near the condition of wool as possible, and it is employed to mix with the cloth to thicken it, as a substitute for good wool. It is used in the manufacture of cloth, upon the same principle that old paper pulp is used to mix with rag pulp. It is short in the fiber and is deficient in strength, but it is difficult to detect it in new cloth. A little wear, however, soon discloses the rotten character of the fiber, as the shoddy rubs off and comes out in fine fuzz, leaving the cloth thread bare. We understand that a superior system of inspection for army and navy cloth now prevails, and that it is scarcely possible for the government to be defrauded hereafter by contractors.

THE TURKISH BATH IN NEW YORK.

Several of our daily papers have stated that there is a project on foot in this city for establishing a Turkish bath, and that several thousand dollars have already been subscribed for the object. It is proposed to erect a building for this purpose; to send to Turkey for a sufficient number of men and women to act as attendants to superintend the various departments, and to fit up the establishment similar to the best baths in Constantinople and Smyrna.

A Turkish bath is peculiar, and entirely different from immersing the body in an elongated vessel containing water. The operation of Turkish bathing consists in, first, seasoning the body; second, manipulation of muscles; third, peeling off the scarf-skin; fourth, soaping; and then the patient is conducted to the bed of repose. These are the five acts of the operation. There are three essential apartments in the building—a great hall open to the outer air; a middle chamber, where the heat is moderate; and the inner hall, which is properly the thermæ. The first scene is acted in the middle chamber, the next three in the inner one, and the last in the outer hall.

The bather having been divested of his clothing, and having his loins girt with a linen apron, is conducted to the first chamber, to which the light is admitted through colored glass windows. The room is well ventilated, but the air within it dry, and heated to 130° Fahrenheit. The bather at first suffers slightly with hurried breathing; but as the perspiration pours from the pores of the skin, which it does most copiously, the respiration becomes normal. Having remained in this temperature for an hour the body is said to be seasoned; he next is taken to the hot-room, where the air is heated to 170°; but so great, however, is the effort of nature to accommodate herself to all circumstances, that he passes into this great heat without feeling the slightest inconvenience. Here the perspiration breaks out without bounds. And lastly, he is taken to the former room, extended upon a slab, where his body is rubbed down, during which process the loose epidermis or scarf-skin is rolled off in masses. The bather now is taken to the cool room, where his body is anointed with soap and is treated to a shower of cold water.

Baths have been employed from time immemorial in all civilized countries, and the ancient physicians, Hippocratus and Galen, recommended them as agents of health and important in the cure of certain diseases. In Egypt, and all parts of the globe where ancient civilization prevailed, vestiges of public baths have been discovered in the ruins of old cities. The Romans were great patrons of public baths. Under the Roman emperors there were 870 public baths in Rome. These edifices were models of architectural taste and ornament. The Turks obtained their knowledge of the bath from the Romans of the Greecian empire. The Turkish bath has been introduced into London lately, and it has been highly recommended by some English physicians. One veterinary surgeon in London has fitted up a Turkish bath for the treatment of diseased horses, and decided success, it is stated, has attended his effort in treating animals affected with chronic rhumatism.

COLORING STEEL BLUE—INLAYING, GILDING AND ETCHING.

The beautiful blue color on portions of sword blades and other steel instruments is not a colored enamel put upon the metal, but a thin skin of the metal itself. It is produced by subjecting the polished blade to a certain degree of heat, and exposing it freely to the atmosphere. Thus, if we take the blade of a knife and polish it highly, then place it upon a plate of iron forming the covering of a furnace it assumes various shade of coloring, according as it becomes heated. At 430° Fah. temperatnre it will become a pale yellow color; at 490° a dark straw color; at 550° a dark purple; at 570° a dark blue; at 600° a pale blue. By removing the blade from the heated plate, when it has attained to any of these shades of color, and cooling it by a few passes through a cold atmosphere, or dipped into water, the color will remain permanent. When examined, the surface of the blade will appear as if coated with a thin skin of blue bronze. It is supposed that this blue film on the steel is formed by a combination of the oxygen of the atmosphere with carbon in the steel. Heat is not the cause of the color, although it is necessary to its production. Sir Humphrey Davy heated a piece of polished steel in a glass vessel filled with nitrogen, in which case no colored film was obtained.

The blue film on steel tends to preserve it from rust. Two plates, the one colored, the other of the same steel polished, were exposed together for a month in the open air during a very rainy season, when it was found that the colored plate was free from rust, while the polished one was entirely covered with it.

Articles of steel are ornamented with gold and silver in different ways. One is to cut burr lines of the figures in the steel when it is soft, then beat in [inlay] gold or silver wire into these lines. Another method consists in putting on the gold or silver by fire gilding. By dipping a piece of polished steel into an ether solution of gold, a very thin coat of the precious metal will be deposited. Articles of steel can also be gilded by the electrotyping process, but the inlaying system is the best, because it is the most durable.

Various devices are put upon steel instruments by means of etching. Every part of the article—sword or knife—to be etched is covered with a varnish (made with resin dissolved in turpentine) excepting those portions which form the design—these are left exposed. The blade is now dipped in dilute nitric acid for a few seconds, then taken out, washed in warm soft water, and then immersed in turpentine, to remove the varnish, and leave all the surface bright excepting those portions which have been exposed to the acid. These are corroded—eaten down below the surface—and form the etched "dead white" design. Various kinds of varnishes may be used for protecting the surface of the steel from the action of the acid. Soap has been used for this purpose when the etching was required to be shallow.

THE COMPOSITION OF STEEL—FRENCH CHEMISTS.

It was formerly supposed that steel was a combination of iron and carbon, in the proportion of about 1½ lbs. of carbon to 100 lbs. of iron. But the fact that certain substances containing nitrogen facilitated the conversion of iron into steel led to the suspicion that nitrogen was also an essential ingredient of steel; and some ten years ago an English chemist, Mr. C. Binks, made a series of experiments to determine this point. He enclosed iron in porcelain tubes so that it could not receive nitrogen from the air, and kept it red hot in contact with carbon alone a sufficient length of time to convert it into steel; but it remained soft iron. He then introduced various other substances into the tube with the iron, and found that when the carbon and nitrogen were both present steel was produced, and not otherwise.

A full account of Mr. Binks's experiments was published, and was received by chemists everywhere as a demonstration that steel is a combination of iron, carbon and nitrogen. This fact is now published in books on chemistry and is a portion of recorded chemical science. On another page will be found a statement of Binks's experiments as given by Muspratt in his great work on chemistry.

After all this publicity, a French chemist, M. Frèmy, has recently been reading papers before societies, and otherwise proclaiming that he has made the important discovery that nitrogen is an essential element in the constitution of steel. The French scientific journals generally publish accounts of M. Frèmy's discovery, and we have not noticed in one of them a single allusion to Mr. Binks.

SAN FRANCISCO STEAM RAIL CARS.

Combined locomotive passenger cars have been put upon the Market-street railway, in San Francisco. The people seem well pleased with the steam horse for animals. The first charter of this railway specified that the cars should be drawn with horses, but the Legislature has amended it, allowing the use of steam in the streets. On the 4th of July, 1861, this company started with one 13-horse power steam-passenger car, and it was then thought that it would do all the work required, but they now run four steam cars, and can scarcely provide for the wants of the traveling citizens. San Francisco has set the example of using steam permanently on the city railways.

THE government of France has granted subsidies to new steamship lines amounting to about $5,000,000 per year. There is one line in operation between France and Brazil, a line is to be started from Suez to China, and another from France to the West Indies and New York. It is stated that none of the ocean steamship lines in the world would pay were it not for government subsidies.

RANKIN'S ARMY TENT.—We gave the address of the inventor of this tent as William Rankin, No. 6 Astor House. It should be No. 6 Astor Place, New York.

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RAILWAYS OF THE WORLD.

There are 31,800 miles of railroads in the United States, of which there are 20,688.51 in the free and but 11,111.43 in the slave States. The total cost of the entire lines has been $1,192,302,015. Last year there were only 631 miles built, against a previous annual average of 2,000 miles. But although the construction of roads decreased, the traffic on all the northern roads was greater than on any previous year. The condition of our railroads is favorable at present.

The length of railways in operation in Great Britain and Ireland is 10,750 miles, 300 miles of which were built last year. Their entire cost of construction amounts to £355,000,000 (about $1,775,000,000). There are 5,801 locomotives, 15,076 passenger carriages and 180,574 freight cars used on these railways. Last year they carried 163,435,678 passengers, 60,000,000 tuns of minerals and 29,500,000 of general merchandise.

France has 6,147 miles of railway, worked by 3,000 locomotives; 3,500 miles of new lines are being constructed. Total cost of completed lines $922,200,000.

Prussia has 3,162 miles in operation; Austria 3,165 miles; the other German States have 3,239 miles; Spain has 1,450 miles; Italy, 1,350; Rome, 50; Russia, 1,289; Denmark, 262: Norway, 63; Sweden, 288; Belgium, 955; Holland, 308; Switzerland, 600; Portugal, 80; Turkey, 80; Egypt, 204.

In the British colonies, there are 1,408 in the East Indies; Canada, 1,826; New Brunswich, 175; Nova Scotia, 99; Victoria, 183; New South Wales, 125; Cape of Good Hope, 28. Making a total of 14,277 miles in operation in the British Empire; the entire cost of which has been $2,086,765,000.

In Mexico there are 20 miles of railway; Cuba, 500; New Grenada, 49½, (Panama Railway); Brazil, 111; Chili, 195; Peru, 50; Paraguay, 8.

The total length of railways in the world is 69,733 miles. Their estimate cost is about $5,877,200,000. Nearly one-half the length of lines belong to the United States; and one fourth to Great Britain and Colonies. The cost of the latter, however, is about twice that of our railroads.

We are indebted to the London *Engineer* for the statistics of foreign railways.

Why Do Men Carry Canes?

One of our exchanges thus discourses about canes:—Can anybody tell us why some men, sound in limbs and strong winded, are tied to canes? We know several persons, who, to all appearances, have no more need of a cane than a jackass has of a tuning fork, that, meet them where you will, their cane is a never absent companion. In some instances this article is several inches too short to be of any service, supposing the owner wanted it for support; in others it is too long; then again it is too weak, being a mere switch. Sometimes the cane is thick and heavy, and if the bearer happens to be a feeble-looking man his cane seems to be a burden to him. Young and middle-aged men, as often as those well advanced in years, use canes. Some go flourishing their sticks along, never once touching them to the ground; some carry them hugged up in their arms; some let them slide half way through their hands at every step, bouncing them on the sidewalk; some carry them as if ready to knock down an adversary; some drop them lightly to the ground, as if fearful of hurting their sticks, or that which came in contact with them; some go with the heads of their canes (especially if they are gold) bobbing about their mouths, particularly when they are still. Nobody, excepting the old or decrepit, knows why he carries a cane. The only use we can see for them is to beat off vicious dogs, if one is attacked; and we reckon people carry canes for the same reason that they snuff, smoke and chew—it is a habit they have acquired.

A PLAN has long been under consideration to open up a steam and water communication between the West and East, by connecting the waters of the Mediterranean and Red Sea. At present, it is said, there are 8,000 laborers employed in digging a canal across the Isthmus of Suez, in Egypt, for this purpose. If it should be completed and put into successful operation it would be of vast influence upon the commercial and political world.

Charcoal in Medicine and as a Disinfectant.

Charcoal powder has been for a long period a favorite remedy in America, the Indies, and in many parts of Europe, for dysentery, and it is extensively used, with success, as a remedy for nervous dyspepsia and other painful disorders of the stomach and bowels.

Dr. Beloc, Surgeon-Major in the French Army, says, in nervous affections of the stomach and bowels; in those complaints which are so prevalent, and attended with so much pain and inconvenience, but which do not confine the sufferers to their bed, such as weight and uneasiness after eating, nervousness from laborious digestion, dyspepsia, pain in the chest, waterbrash, &c.; for each of these disorders, the powder of charcoal is the most effectual in relieving pain, restoring the digestive powers, improving the appetite, and enabling the stomach to bear food. Some vegetable substances contain less than 75 per cent of carbon, the remaining 25 per cent consisting of earthy mineral and deleterious matter. Charcoal possesses the property of absorbing noxious gases. M. Lowitz, a German chemist, about the year 1789, first applied this substance for deodorization and purification. M. Theodore de Saussure, by a series of experiments, proved its power of altering the character of foul gases, by its peculiar properties. Mr. Turnbull, of Glasgow, in experimenting on the qualities of manure, covered 350 dead horses with charcoal, and no unpleasant odor was emitted from them. He also placed the body of a dog in a wooden box, for more than six months, in which he put a layer of charcoal, and covered it over with another layer, of a few inches in depth. The box was left uncovered in his laboratory, from which no offensive smell was ever discovered. The property of charcoal to restore sweetness to tainted meat was shown by Lowitz, when in St. Petersburg, in 1786.

Different Flour and Grain Markets.

In Chicago the flour of spring wheat is selling at from $3 75 to $4 per barrel; winter wheat flour at $4 25 to $4 65. Spring wheat ranges from 66 to 72½ cents per bushel; winter wheat at from 75 to 80 cents. Corn at from 18 to 20 cents. Rye at 33 and 34 cents. Barley at 35 and 40 cents. Oats 22 and 23 cents. In New York flour ranges from $5 50 to $7 25 per barrel. Genessee extra brands, Southern and Missouri brands bring the highest prices. Chicago flour is an inferior article to these high-priced brands. Virginia flour brings $7 25 per barrel. It is preferred by pastry bakers and for shipment to warm climates, as it contains less moisture than Northern flour. Any wheat flour, however, if kiln dried before being packed in barrels will keep as well in warm climates. Chicago spring wheat is selling in New York at from $1 29 to $1 33 per bushel, and winter wheat (red) at from $1 38 to $1 44. Northern rye is selling at from 83 to 85 cents; barley, 80 to 90 cents; oats, 40 to 42 cents; corn, 65 cents, mixed, to 86 cents, Southern white. Flour and grain have advanced in prices during the past week. The rise in flour has been 10 cents per barrel for all grades. The demand for export has greatly improved since the peaceful solution of the Mason and Slidell affair. Corn, rye and barley have gone up about two cents per bushel. From the 1st of January to the 21st, 955,615 bushels of wheat have been exported from New York, against 606,278 for the same period in 1861. Of corn, there has been exported 674,417 bushels, against 393,610 in the same period last year. Of wheat flour, exported, there are 221,390 barrels this year against 106,947 in the same time last year.

VICTORIA BRIDGE.—The Montreal *Advertizer* says heavy gates to close the tube of Victoria Bridge are in course of preparation; and a strong picket guard will be stationed at each entrance. When the gates are hung, they will be opened to allow the passage of trains, and immediately closed; and the doors of all passenger cars will be locked to prevent any person leaving them while passing through the tube. These precautions are taken to prevent the threatened blowing up of the tube.

THERE were 86 steamers built at Glasgow, Scotland, in 1861; their gross tunnage amounted to 62,875 tuns. At present their are 34 steamers being built at the same place, the tunnage of which will amount to 30,350 tuns.

Photographic Discoveries of M. Niepce de Saint Victor.

The Paris correspondent of the *Photographic News*, (London) thus alludes to the above distinguished Frenchdiscoverer:—

The Tremont prize for 1861, has been unanimously awarded by the commission to M. Niepce de Saint Victor, in preference to the claims of other candidates, for the following reasons:—

The *debut* of M. Niepce de Saint Victor was very remarkable. The object of his first effort was to take copies of engravings or of designs in black on a white ground, by exposing these engravings or designs to the vapor of iodine. The iodine attaches itself to the black lines of the engraving, &c., and when the design so iodized is placed in contact with a sheet of starched paper, the lines of the engraving, &c., to unite in preference with the starch of the white paper.

M. Niepce gave a considerable impulse to photography by his application of iodized albumen to glass plates: when this film becomes dry, he immersed it in a solution of aceto-nitrate of silver, and then exposed it to the action of light in the camera. He thus obtained a negative proof from which any number of positives could be afterward taken on surfaces impregnated with substances sensitive to the influence of light.

M. Niepce demonstrated the remarkable fact that certain bodies receiving the rays of the sun, possess the faculty of afterward acting in the dark upon matters sensitive to light, as if the first bodieswere themselves luminous, the sun communicating to them a power of action which they retain for entire months in the dark.

M. Niepce starting from the beautiful researches of M. Edmund Becquerel on the coloration of matters sensitive to light; also recognized a very remarkable action in chloride of lead, under the two-fold relation of the whiteness, and of the duration of the color of the image submitted to the influence of light. This discovery M. Niepce will soon lay before the Academy.

M. Niepce is an example of what a decided vocation can accomplish. Educated at the cavalry college of Saumur, he early made himself a name in science, by researches marked by originality; the academy always received them with sympathy, independently of the interest inspired by the author of them, then a stranger to every scientific body, and whose first researches, commenced at a distance from the capital, were successfully carried on in a barracks, amid the distractions of military duties, always faithfully performed. When M. Niepce generously abandoned his discoveries to the public, he never entertained the idea of deriving the least personal advantage from them, and he executed most of his researches at his own expense. Therefore the commission unanimously award him the Tremont prize of 1861.

Horses Falling in the Streets.

In a letter addressed to the Albany *Evening Journal*, from London, by Mr. Thurlow Weed, he says:—"But what surprises and perplexes me most, in the city, is the fact that while the great omnibus thoroughfares, Oxford street, Piccadilly, the Strand, Fleet street, Ludgate and Corn Hill, paved like Broadway, are generally wet and always slippery, the horses never, or very seldom fall!" The patent horse shoe, illustrated on page 224, Vol. II. (new series) SCIENTIFIC AMERICAN), if generally adopted would prevent horses falling in our streets or on the most slippery roads during winter, when snow and ice are upon the ground.

MAXIMS ON TIME.—Time is like a creditor, who allows an ample space to make up accounts, but is inexorable at last. Time is like a verb that can only be used in the present tense. Time, well employed, gives that health and vigor to the soul which rest and retirement afford to the body. Time never sits heavily on us but when it is badly employed. Time is a grateful friend; use it well, and it never fails to make a suitable requital.

THE ladies are introducing a new and beautiful ornament for the parlor mantel or centertable. They take large pine burs, sprinkle grass seed of any kind in them, and place them in pots of water. When the burs are soaked a few days, they close up in the form of solid cones, then the little spears of green grass begin to emerge from amongst the laminæ, forming an ornament of rare and simple beauty.

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Rifled Small Bore Arms--Enfields Condemned.

The following interesting extracts on this important subject are from the *Army and Navy Gazette*, published in England :—

The late Lord Herbert, when Secretary for War, claimed a "ten years' life" for the Enfield rifle ; experience proves, however, that its longevity is even less than this, and practicians know full well that long ere that prescribed decade has run its course, the weapon, owing to an inherent susceptibility to the abrasion of the bullet and the frictional action of the ramrod, especially towards the muzzle, where the grooves are shallowest and barrel weakest, ceases to be a rifle in all save name. Thus it is notorious that even at Hythe School of Musketry, the Enfield rifles of 1853, and even of a more recent date, have had to be put aside as worn out and effete. Under such circumstances, the economy of continuing the manufacture of this description of rifle, and of its retention as a service arm, may well be called in question.

The trajectory of the Enfield is absurdly high. At great distances the bullet plunges, and the "dangerous space" is reduced to a few yards, thus necessitating an elaborate system of judging distances, the practical application of which is attended with doubtful results. But it is when put in the scale, and pitted against rifles which have emanated from the private gun-factories of this country—rifles which are made use of at every volunteer rifle-match, to the almost entire exclusion of their military rival—that we become thoroughly cognizant of the great inferiority of the Enfield rifle ; and the prevailing impression made on the mind is that of utter astonishment that we have so long remained satisfied with it as a military arm. Nor is this feeling diminished by learning that small arms on the Whitworth principle, which combines in so preëminent a degree durability of construction with lowness of trajectory, can be manufactured at Enfield factory at a slightly enhanced cost of some 5s. per rifle over the Enfield.

Last spring at Hythe, in presence of General Hay, Lord Elcho and Mr. H. Vivian, M. P., experiments were actually carried out with rifles thus constructed, the barrels being made of the ordinary welded Enfield gun metal, while the bore had the polygonal rifling of the Whitworth, when, contrary to all expectations, it was found that this pseudo-Whitworth actually fired with a slightly lower angle of elevation than the *bona fide* Whitworth itself, which had heretofore been supposed to possess an unapproachable superiority by virtue of the special character of the metal from which the barrel is made.

The Duke of Wellington, was obstinately wedded to "Brown Bess," with its large bore, and the longer he lived the firmer became his faith in the large bore, and the necessity of making a big hole in the enemy ; and so in our day, dogmatic optimists maintain that the Enfield rifle is "good enough," and gravely argue that the caliber of the Whitworth rifle—.45 of an inch—is too small, and that, in order to kill a man, a projectile must have a diameter of .577 of an inch. "They teach us how to split a hair," forgetful of *Mercutio's* significant exclamation on being congratulated on the smallness of what proved his death wound—"No! 'tis not so deep as a well, nor so wide as a church door ; but 'tis enough—'twill serve."

At Inkerman an Enfield bullet was known to pass through four Russians, and it is stated authentically that during the most critical period of the Indian mutiny, when time and ammunition were precious and rebel prisoners too abundant, it was found that the Enfield bullet was capable of penetrating through eight sepoys at one shot! Taking the former data, however, for the terms of our ratio, it still follows, by the simple application of the rule of three, that a Whitworth projectile would have penetrated the bodies of ten Russians, seriously wounding the eleventh! This will be more readily conceded on our quoting the result of experiments made at Hythe, in 1857, to test the comparative penetration of these missiles. On the occasion referred to "the Whitworth projectile, with the regulation charge of powder, went through 33 planks, and was brought up by a solid oak balk beyond, while the Enfield ball could not get past the 13th plank."

The other argument usually urged against the gradual adoption of a rifle with a smaller bore than that of the Enfield is that it would involve our having two sizes of ammunition in the service, but this objection cannot surely be seriously entertained, inasmuch as the evil, if such it can be called, would be merely of a temporary character ; moreover, the exception loses much of its force from the fact of our artillery having many different sizes of ammunition in use at one time.

We cannot but express regret, before quitting this subject, that the volunteers, who were expected by the regular service to originate so much of a progressive character as to weapons of war, should have contented themselves with the rifle of the private soldier, instead of making a strenuous effort to obtain a small-bore breech loader, with a trajectory so low and flat that the necessity of judging distance would have been destroyed, and the close advance of avalry on infantry rendered impossible.

Great Experiments with Heavy Guns and Iron Plates.

The London *Times* of December 29th contains the following account of a trial with a large target similar in every respect to a section of the side of the iron-plated frigate *Warrior* :—

The target was a perfection of the *Warrior's* broadside, twenty feet long and ten high, made by the Thames Iron Company, of exactly the same materials as the *Warrior* itself. This was erected at 200 yards' distance from a battery of six guns—two solid 63-pounders, three of Armstrong's 100-pounders, and one 120-pounder shunt gun. Every one knew before the experiments commenced that such a target would stand an immense amount of pounding, and the chief curiosity was evinced to see how the teak backing would support the plates, and, above all, how the rivets in the ribs would resist the tremendous concussion. No one, however, was prepared for the astounding success of the result that did ensue, and which showed itself at the close of the experiments, during which the target was subjected to every conceivable ordeal of artillery practice, yet survived comparatively uninjured, and practically as invulnerable as ever. The guns were fired in volleys of threes and fours and sixes simultaneously. Their shot were concentrated upon white spots painted on what were supposed to be the parts most likely to yield. On these the fire of the most tremendous missiles—100-pounders and 120-pounders and even 200-pounder bolts—were directed with a force and weight that seemed irresistible ; but in vain. The shot flew off in ragged splinters, hissing through the air, the iron plates became almost red hot under the tremendous strokes, and the whole target rang like a huge gong, but nothing more. As a rule, the 68-pounders left their marks in massive dents more deeply than the 100-pounder Armstrongs, but the live percussion shell of either did little more than discolor the plates with the smoke of their impotent explosions. Two discharges, each of three 200 lb. cast-iron bolts, were fired in succession at two different spots, but though, of course, the plates had been often struck before in the same places, the additional injury was comparatively trifling. A grand final salvo was given with all the six guns, trained three on each of the already-battered spots. As the guns were loaded each with 16 lbs. of powder, this volley, in fact was equal to 600 lb. shot fired at the target with 100 lbs. of powder. The effect of the tremendous trial was to make a gap on one side of the target about fifteen inches long, and five deep, driving the iron, in fact, almost into the teak. Some bolts of the plates were also loosened, and the plates themselves began to crack under their long ordeal. Yet, strange to say, even under this the strong teak backing was still undisturbed, and not even the paint on the rivets had started. In fact, as representing the side of a ship, she would still have been perfectly water-tight and uninjured. The tonguing and grooving by which the edges of the plates are dovetailed into each other had given way, as we always maintained it would, and some of the plates themselves had started outward as much as an inch and a half. But the target, as a target, was as good as ever. There is only one possible condition in which the *Warrior* could be placed to be exposed to a concentrated fire as severe as that to which her section was subjected at Shoeburyness, and that would be if she stranded within 200 yards of the guns of a powerful fortress. Even then, in such a last extremity, we are very much inclined to believe the *Warrior* would be quite as formidable to the fort as the fort to her.

The practical result of this grand experiment has been to show that nothing is gained by backing up the armor plates with such a tremendous thickness of teak as twenty inches. It is found that practically ten inches will do as well as twenty, and that the saving thus effected in the reduction of weight will allow another inch thickness of iron to be used in the plates themselves. Thus the "improved *Warriors*," now building, instead of four and a half inches of armor and twenty inches of teak, are to have ten inches of teak and five and a half of iron—an addition to the metal covering which is really unnecessary, as they are already invulnerable, in the most perfect and literal sense of the term, to all the efforts of artillery.

Life-Saving Association.

The Life-Saving Benevolent Association have elected the following officers for the ensuing year :—Thomas Tileston, President ; Charles H. Marshall, Vice-President ; John D. Jones, Secretary ; W. H. H. Moore, Treasurer. The Association have also adopted the following resolutions :—

Resolved, That the gold medal of the Association, suitably inscribed, be presented to Lieut. John W. Kittredge, U. S. N., for his humanity, energy and skill in rescuing a little boy from drowning in the bay of New York on the 20th of July last.

Resolved, That the sum of twenty-five dollars be presented to Charles Hungerford, one of the crew of pilot boat No. 16, for jumping into the water in the Narrows near Fort Hamilton, and rescuing a little girl from drowning, whose mother under misfortune exposed her to this fate, on the 16th of August, 1861.

Resolved, That the gold medal of the Association be prepared for Hamilton E. Towle, and incribed as follows :

"Presented to Hamilton E. Towle for his ingenious contrivance of a steering machine, which he fitted in the steamship *Great Eastern*, under circumstances of great peril, and subsequently of complete success in saving the lives of numerous passengers and of that noble ship."

Our readers will remember that the steering apparatus referred to was illustrated on page 264 of our last volume. Mr. Towle has since opened an office for Civil Enginering at No. 160 Fulton street, this city.

PREVENTION OF WOOD ROTTING.—To prevent posts and piles from rotting the following coating has been recommended, which is the more suitable since it is economical, impermeable to water, and nearly as hard as stone :—Take 50 parts of rosin, 40 of finely-powdered chalk, 300 parts (or less) of fine white sharp sand, 4 parts of linseed oil, 1 part of native red oxide of copper, and 1 part of sulphuric acid. First heat the rosin, chalk, sand and oil, in an iron boiler ; then add the oxide, and with care, the acid ; stir the composition carefully, and apply the coat while it is hot. If it be not liquid enough, add a little more oil. This coating, when it is cold and dry, forms a varnish which is hard as stone.

THE PATENT OFFICE AND SEEDS.—Large invoices of seeds have lately been obtained from Europe at the Patent Office, and have been made up in packages for members of Congress, each of whom will be furnished with 417 papers, comprising forty-two varieties of the valuable seeds referred to, making an aggregate of 94,659 papers. To Agricultural Societies throughout our country there will be transmitted 47,329 papers, including all the varieties, and 47,329 papers will then remain for general distribution amongst persons making application from any part of the country.

THE condition of affairs at the Patent Office is at present most satisfactory. The number of applicants for patents is daily increasing, and the examiners act upon cases so quickly now that it encourages some inventors to apply for patents who formerly neglected to do so, owing to the tardiness of the officials in deciding upon applications.

TO STOP BLEEDING.—A correspondent of the *American Agriculturist* writes that bleeding from a wound in man or beast may be stopped by a mixture of wheat flour and common salt in two parts bound on with a cloth. If the bleeding be profuse, use a large quantity, say from one to three pints. It may be left on for hours, or even days, if necessary.

JOSEPH E. CARVER, the well-known cotton gin manufacturer, at Bridgewater, Mass., has left here for Port Royal, having an engagement with the United States government relative to ginning the cotton gathered in that vicinity by Gen. Sherman's "contrabands."

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NOTES ON FOREIGN INVENTIONS AND DISCOVERIES.

Stereotyping.—A patent has been taken out in England by J. Napier, Glasgow, for an improved mode of forming stereotype plates. Under one modification of the process a smooth cast-iron plate is prepared to receive the plaster impression as follows:—A piece of cartridge paper is cut the size of the plate and pasted on its smooth surface. Plaster of Paris of the consistence of cream is then poured upon the paper and the surface leveled to the required thickness by means of a "straight edge." The form containing the type, locked up in the usual manner and oiled upon the surface, is immediately inverted, laid face downward upon the soft plaster and pressed, and is thus allowed to remain until the plaster has hardened. The form is then lifted off and the plaster matrix dried from the metal side upon an ordinary type-founder's furnace. A flat cast-iron plate covered with paper is provided with metal gages to regulate the thickness of the stereotype plate. The matrix plate is now screwed to this plate, and when both are well heated, the molten metal is poured in between, and an exact counterpart of the form is obtained. After cooling it is planed and finished.

Steel.—William Clark, London, has obtained a patent for converting iron into steel as follows:—A mixture of carbonate of baryta and finely pulverized bituminous coal is placed in a crucible, or into a retort, and bars, or pieces of less size, of iron are placed among this mixture, and the whole heated to a bright red heat, at which temperature it is maintained for several hours. After this roasting the metal is taken out and cooled, and when broken it is stated to have the grain and hardness of steel, and is capable of being wrought and tempered.

Aluminum Bronze and Coating Metals.—The following is the substance of the specification of a patent taken out by Thomas Bell, of Gateshead, England, for decomposing compounds of aluminum (such as the double chloride of aluminum and sodium) by galvanic electricity, and coating metals, such as copper by the same agency. A bath is made up composed of the double chloride of aluminum and sodium in an anhydrous state, and this is kept melted at a temperature of 360° Fah. The plate of copper to be coated with aluminum is placed on the negative electrode; the positive electrode may be a plate of alumina, or a composition of carbon and anhydrous alumina molded and calcined so as to form a plate. When the galvanic circuit is formed, the alumina in the bath of double chloride is deposited on the copper plate, which must have been perfectly clean before being placed in the bath. When an aluminum deposit of sufficient thickness is obtained, the copper plate is removed and dried, then placed in a furnace and heated to a high temperature. The aluminum combines with the copper and the surface of the plate is converted into aluminum bronze.

Iron Telegraph Posts.—An English patent has been taken out by R. Jobson and C. F. Farley, for telegraph posts made of cast iron in tubular sections, capable of being easily transported and fitted together.

RECENT AMERICAN INVENTIONS.

Cooking Ranges.—This invention consists in arranging in the back part of the fire chamber of a cooking range a rotating cylinder or frustum of a cone, one portion or side of which is of fire brick or other equivalent substance or material, and the opposite portion or side forming a water back, an air-heating chamber, being between the fire brick and water back; whereby either the water back or fire brick may be made to form the back of the fire chamber, as may be desired, and an air-heating chamber obtained, which may be constantly used, or in other words, used in either of the two positions of the cylinder or frustum of a core. The invention also consists in a peculiar means employed for operating the cylinder or frustum of a cone, as well as a novel arrangement for automatically supplying the water back with a flow of water and cutting off the same. For any information concerning this invention address F. C. Merritt, 1212 Broadway, New York city.

Coal-Oil Distilling Apparatus.—This invention, patented by John Bullard, of Stockbridge, Vt., relates more particularly to that class of retorts in which the heat to effect distillation is derived from the slow burning away of the charge toward the outlet. It consists in the construction and arrangement of such a retort in such manner and with its outlet in such a position as to obtain a draft along the bottom and obliquely downward to the lowest point in the retort throughout the whole of the charge, by which means the difficulties encountered in the working of the so-called "meerschaum" retort, in which the draft is directly downward through the charge, and those encountered in the working of horizontal or slightly-inclined retorts, in which the draft is toward an opening distant from the bottom, are obviated. It also consists in the introduction of steam into and through the bottom of the retort to heat it before firing, and to prevent the vapors condensing in the kiln and being burnt therein. And it further consists in certain novel means of obtaining a draft through the kiln, serving at the same time as a means of condensation for the vapors.

Harvester.—This invention relates to a new and improved means employed for elevating the sickle, whereby the same may be raised bodily in a horizontal position so as to pass over obstructions which may lie in its path, and the sickle at the same time admit of being so arranged as to work or turn on a shaft attached to the main frame of the machine, said shaft forming the only attachment of the sickle to the main frame. The invention consists in using, in connection with a cord and pulley, arranged to actuate or adjust the main frame of the machine, a pawl and segment rack so arranged that the sickle is held in a horizontal rigid state as the main frame is actuated, and its back part elevated, and the desired result thereby attained. Invented by E. Smith, of Cold Spring Harbor, New York.

Cements for Porcelain, Marble, Alabaster, Glass, &c.

Take of isinglass two drachms, wet it with water, and allow it to stand until softened, then add as much proof spirit as will rather more than cover it, and dissolve with a moderate heat. Take of gum mastic one drachm, dissolve it in two or three drachms of rectified spirit. Mix the two solutions, and stir in one drachm of gum ammoniacum in a fine powder, and rubbed down with a little water. Keep the cement in a bottle. When required for use place the bottle in warm water, and apply the cement with a stick or small hard brush to the china previously warmed. Compress the pieces firmly together until cold, taking care to make the contact perfect, and using a very thin layer of cement.

The white of eggs thickened with powdered quick lime is also used as a cement for broken china, marble and glass.

White resin and white beeswax melted and mixed with plaster of Paris make a good cement for mending alabaster and marble ornaments.

A transparent cement for glass is made by dissolving one part of india rubber in chloroform, and adding sixteen parts, by measure of gum mastic in powder. Digest for two days, and frequently shake the vessel in which these substances are contained. The cement is applied with a fine camel's-hair brush.

The silicate of soda is about the best cement that can be used for mending broken crystal.

NORTHERN TURPENTINE.—A correspondent of the Philadelphia *Ledger* directs public attention to the pine forests of New Jersey and Pennsylvania from which to obtain a supply of turpentine. He says:—"The mode pursued for obtaining 'the juice,' of white or common turpentine, as it is called, is as follows: A reservoir is made in the trunk of the tree, a few inches from the ground, capable of containing two or three pints of liquid. Into this, which should be prepared in the winter season, the juice will commence to flow early in the spring, increasing in quantity with the summer heats, and subsiding with the autumn. As the reservoir becomes filled the liquid is transferred to barrels, where it gradually thickens and becomes a soft solid. From this the spirits are distilled, and the residue, as is well known, is common rosin."

FOGS have been frequent and very thick in London this winter. The gas has been kept lighted in street lamps and houses all day on several occasions. The weather has been mild.

Saltpeter—Imports in 1861.

The imports from India into the United States, for the year, have been, 36 ships at Boston, 65,073 bags; 13 ships at New York, 29,286 bags; 3 ships at Philadelphia, 5,861 bags. Total, 100,220 bags. In addition to the above, there have been imported from Europe, into Boston, 1,253 bags; into New York, 160 bags. Total, 1,413 bags. Total imports into the United States for 1861, 101,633 bags. There are also 886 bags on the way from London, bound to New York, shipped in November. A considerable portion of that to arrive has been sold to, or is imported by consumers. The principal manufacturers have had large orders from government for powder, the past six months, and are still busy on these contracts. The general powder business has been small for some time, particularly since our government has prohibited the export of powder. In January, 1861, the price was 8 cents per pound. In August it rose to 9 cents. On the 1st of December it was 10½ cents. On the 16th of last month warlike news from England, growing out of the *Trent* affair, and also advices that the export of the article from Great Britain to the United States had been prohibited, were received. The market was greatly excited, and prices advanced rapidly, with considerable sales on speculation, at 14½ to 17 cents per pound, cash. The article at present is less active, with more disposition to sell, and with little demand, and prices are somewhat nominal, and may be quoted at 12 to 14 cents per pound. The stocks in the country and on the way are moderate.

Commerce of New York for 1861.

The value of foreign goods imported in 1861 was $125,688,000, of which $7,309,000 were reëxported, leaving the total for the market valued at $118,379,000. In the year previous (1860) the value of goods imported was $221,384,000, or $103,005,000 more than last year. The exports of domestic produce (chiefly breadstuffs) were valued at $131,236,000; in 1860 only $95,468,000. The export of specie in 1861 was but $4,236,000; in 1860 it was $42,191,000. The import of specie from foreign countries in 1861 was $37,088,000; from California, $33,485,000, making a total of $66,347,000 of specie that remained for home use. The revenue of customs amounted to only $21,715,000.

DURING the past ten years the Western Railroad, Mass., has expended in the aggregate $70,000 to keep the track clear of snow and ice. City companies pay large sums for this purpose.

NEW YORK MARKETS.

ASHES.—Pearl, 6¼c. per lb.

BEESWAX.—Yellow, 33c. per lb.; good demand.

COAL.—Anthracite, $4 25 to $4 75 per 2,000 lbs.

COCOA.—18½ to 30c. per lb.

COFFEE.—14c. to 27c. per lb.; the demand is good.

COPPER.—Ingot, 28c. per lb.; sheathing, 30c.; good demand.

CORDAGE.—Manilla, 10¾c. per lb.

COTTON.—The market is dull; 33c. to 35c. per lb.; none of the higher quality for sale. From the 1st to the 25th of January 5,345 bales were imported—mostly from Liverpool.

DOMESTIC GOODS.—Brown sheeting, 30 inches wide, 9c. to 11c. per yard; bleached, 32 inches wide, 12c. per yard; 36 inches wide, 16c. per yard; calicoes, 11c. to 13c. per yard; drilling, 30 inches wide, 16c.; Kentucky jeans, 8c. to 18c.; cloth, all wool, $1 60 to $3; cotton warp, wool weft, 75c.; satinets, 30c. to 60c.; wool flannels, 30c. to 60c.; cantton flannels, 14c. to 18c.

FLOUR.—From $5 50 to $7 25 per bbl.; cornmeal, $3 to $3 10; rye, $3 50 to $3 80.

GRAIN.—Wheat, $1 26 to $1 52 per bushel; corn, 65c. to 87c.

HEMP.—American, dressed, $215 to $230; Russian, $250 per tun.

INDIGO.—Bengal, $2 20 to $2 40 per lb.; manilla, 80c. to $1 50. Scarce.

IRON.—American pig, $20 per tun.

LEAD.—$7 to $7 15 per 100 lbs.; good demand.

LEATHER.—Oak, tanned sole, 26c. to 33c. per lb.; hemlock, 18c. to 22½c.; demand good for oak tanned.

LUMBER.—Nothing doing.

MOLASSES.—20c. to 50c. per gallon. The total home consumption of molasses in 1861 was 40,191,556 gallons—about 7,000,000 less than in 1860.

NAVAL STORES.—Turpentine and resin out of market.

OILS.—Sperm oil is in good request at $1 40 to $1 60 per gal.; petrolium, dull; crude, 16c. to 19c. per gal.; refined, 30c. to 40c.; burning fluid (camphene and alcohol) 67c.

PROVISIONS.—Mess pork from $8 to $14 50 per bbl.; beef, ranging from $5 to $30 per bbl., according to quality; butter from 11c. to 23c. per lb.

SALTPETER.—13c. to 16c. per lb.; good demand.

SUGAR.—From 8c. per lb., the lowest Melado, to 11⅛c. Stuart's best crushed; market dull.

TEA.—30c., the lowest, to 97c. per lb. The duty is 20c.—alike on all qualities.

WOOL.—9c., the lowest South American; 52c. per lb.; American Saxony fleece. Prices on the advance.

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ISSUED FROM THE UNITED STATES PATENT OFFICE

FOR THE WEEK ENDING JANUARY 21, 1862.

Reported Officially for the Scientific American.

*** Pamphlets giving full particulars of the mode of applying for patents, under the new law which went into force March 2, 1861, specifying size of model required, and much other information useful to inventors, may be had gratis by addressing MUNN & CO., Publishers of the SCIENTIFIC AMERICAN, New York.

34,187.—T. C. Andrews, of Leverington, Pa., for Improvement in Tobacco Pipes:

I claim the tobacco holder, c, with its perforated base and the flange, e, or its equivalent, when applied to the bowl of a pipe, and serving as a detachable lining for the same, as and for the purpose set forth.

34,188.—Lewis Baird, of Cambridge, Mass., for Improved Mode of Preventing Incrustation in Steam Boilers:

I claim the employment of tobacco, or a decoction or extract of the same, for the purpose of preventing the incrustation of steam boilers, or of removing the scale therefrom.

34,189.—J. E. Balderston, of Philadelphia, Pa., for Improved Splicing Bar for Axles:

I claim the splicing bar, A, with its journal, b, and the strap bolts, e e, the whole being constructed and arranged for application to a broken axle as and for the purpose set forth.

34,190.—M. W. Baldwin, of Philadelphia, Pa., for Improved Rotary Engine:

I claim the flexible diaphragm and disk, in combination with the rollers, whereby, by the action of steam or other fluids between the diaphragm and disk, the rollers are propelled in the manner described.

34,191.—Charles Beidler, of Allentown, Pa., for Improvement in Plows:

I claim attaching the nose, F, to the plow by means of the screw bolt, c, passing through the projections, a b, of the landside and moldboard, and provided with the collar, f, and share brace, g; all arranged as and for the purpose set forth.

[The object of this invention is to obtain a plow of a superior class, which may be constructed very economically, and in a durable manner, and be of light or easy draft, and capable of being very readily adjusted to plow deep or shallow.]

34,192.—Magnus Benas, of New York City, for Improved Tanning Composition:

I claim the employment or use for tanning purposes of a decoction of Rhatany, Tormentilla and Granadilla roots, in connection with Cinchone and Cascarilla barks, substantially in the proportions specified, and using said solution with Bombay catechu, alum and common salt, in the proportions about as specified, and substantially as described.

[The object of this invention is to expedite the process of tanning, reduce the expense and obtain a superior quality of leather, and have the invention applicable for the tanning of calf, sheep and other light skins, as well as applicable for tanning heavy skins for the production of kip and harness leather, and also sole leather.]

34,193.—Thomas Blanchard, of Boston, Mass., for Improved Scoop Shovel:

I claim a scoop shovel with a bent rim or side, B, having a handle, A, and bottom, E, attached to it, constructed substantially as shown and described.

[This invention relates to a new and useful improvement in the construction of scoops such as are used by farmers for shoveling or scooping grain, roots, &c., and also used for shoveling or scooping coal and similar articles or substances.]

34,194.—J. F. Brooks, of Stafford Springs, Conn., for Improvement in Road Scrapers:

I claim, first, The attaching of the scraper, C, to the frame, A, of the machine, substantially as shown, to admit of the scraper being adjusted in a more or less inclined position, for the purpose specified.

Second, Attaching the draft pole, B, to the frame, A, in the manner substantially as shown, to admit of the pole being adjusted either at right angles with the scraper, or obliquely therewith, for the purpose set forth.

Third, The combination of the adjustable scraper, C, and draft pole, B arranged for joint operation as and for the purpose described.

[The object of this invention is to obtain a road scraper which will admit of being so adjusted as to scrape the dirt or earth to either side of it, or to scrape the earth up and carry it in front for short distances, and also be capable of being adjusted so as to compress the earth and level it where desired.]

34,195.—John Bullard, of Stockbridge, Vt., for Improvement in Apparatus for Distilling Coal Oil:

I claim an egg-shaped retort, arranged substantially as described, with draft opening at its lower end, so that the unburned contents of the retort will always be within the lines of the draft, all as set forth.

Second, In a retort in which the distillation is effected by the gradual burning away of the charge toward the outlet, I claim the introduction of steam into and through the bottom, substantially as and for the purpose specified.

Third, The combination with the outlet of the retort of a still which has its interior pipes provided with a cold water injection, as and for the purpose shown and described.

34,196.—Alfred Burchard, of Sylvan, Mich., for Improvement in Iron Cutters or Sleighs:

I claim the construction and use of wrought iron or steel braces, supports, bolts and nuts, when used and in combination with the running parts of sleighs or cutters made exclusively of wrought iron or steel, in the manner and form and for the purposes as described.

34,197.—L. D. Cowles, of Armada, Mich., for Improvement in Carriages:

I claim, first, The combination of the springs, E G, attached to the axle of a two-wheeled carriage by means of a rolling joint, e f, with the stationary spring F, when arranged and operating in the manner set forth.

Second, The combination of the volute springs, H J, with the rolling springs, E G, and stationary spring, F, when arranged in the manner described.

[This invention consists in a peculiar construction and arrangement of springs of an ordinary two-wheeled carriage, whereby the lateral and nodding motion of the same produced by one of the wheels striking against an obstruction in the road or dropping into a rut, is neutralized, and a gentle and easy motion given to the carriage.]

34,198.—J. H. Connelly and J. W. Phillips, of Wheeling, Va., for Improved Steam Boiler Furnace:

We claim, first, The introduction of petroleum, or well oil into the furnace of steam boilers by means of the steam jet or pipes, for the purpose of facilitating the combustion of the gases of the fuel, whether wood or coal.

Second, We also claim the side furnace, a, in connection with the boiler, b, reservoir, d, steam pipes, c, and oil pipes, e, constructed and arranged substantially as and for the purposes specified.

34,199.—Alanson Cary, of Worcester, Mass., for Improvement in Starting Apparatus for Horse Railroad Cars:

I claim, first, The combination with one of the wheels on the axletree of a rail car of a ratchet wheel, E, or its equivalent, and two dog levers, F F′, provided with dogs or moving pawls, substantially as and for the purposes set forth.

Second, The combination of a ratchet wheel or device fast to one of the wheels of a rail car, as set forth, and a suitable pawl device suspended so as to be free to vibrate or oscillate around the axis of said wheel, with suitable mechanism so constructed and combined with the body and platform of the car as to enable the driver to start the car while attending to his team at the front of the car, for the purposes set forth.

Third, The peculiar construction and relative arrangement of the dog levers, F F′, whereby the pawls and stop devices are well protected by their flanges, d d′, and whereby one is made to fit and work against the other like a rule joint, and operating levers, G G′, are brought one over the other, as shown.

Fourth, Operating the dog levers, F F′, by means of the hand crank, L, at the front of the car, substantially as shown and described.

Fifth, The mode of throwing the operating dogs in and out of action with the ratchet teeth, substantially as described.

Sixth, Forming the operating dogs, e e, in the peculiar manner set forth, and as shown in Fig. 6.

Seventh, The combination of the dog levers, F F′, with the tubular projection, C′, of box, C, whereby all friction and wear of the parts, when the starting device is not in operation, is avoided, as described.

Eighth, The combination of the tubular brake shaft, K, with its hand crank, L′, and hand crank, L, with its central shaft, with the fender board on front of the car, substantially as described.

34,200.—John Duke, of Milesbury, Pa., for Improved Roofing:

I claim a roof constructed in the manner and of the materials as set forth.

34,201.—M. Easterbrook and J. M. Wood, of Geneva, N. Y., for Improvement in Machines for Peeling Willow:

We claim, first, The two pressure wheels, D F, when provided respectively the one with a V-shaped groove, b, and the other with a beaded projection, c, and used in combination with a stripping device formed of the projections, m, of plate, L, for the purpose set forth.

Second, The projections, m, attached to yielding slides, i, which are fitted in a plate, L, between the bars, K K, and arranged in relation with the wheels, D F, to operate as and for the purpose specified.

Third, The combination of the weels, D F, projection, m, of the plate, L, rotary brushes, M M, and discharging rollers, N N, all arranged for joint operation as and for the purpose set forth.

[This invention relates to a new and improved machine for stripping the bark from willow preparatory to the manufacture of the same into basket. The invention consists in the employment or use of two pressure wheels, one of which has a V-shaped and the other a grooved periphery and using in connection therewith a stripping plate, rotary brushes and discharging rollers.]

34,202.—J. D. Flansburgh, of Philadelphia, Pa., for Improved Culinary Pot:

I claim, as an improved article of manufacture, the culinary pot described, the same having the supplementary handle, c, cast thereon, substantially as set forth, and for the purposes specified.

34,203.—B. W. Franklin, of New York City, for Improved Fusible Gage for Temperatures:

I claim the described fusible gage, the fusible alloys being used in the peculiar manner specified, thus indicating the temperature by the condition of the alloy, whether the same be granular, semifluid or fluid, substantially as set forth.

34,204.—W. C. Goodwin, of Hamden, Conn., for Improved Folding Arm Chair:

I claim the folding arm chair made with double seat rails, when the substance used for the sacking, or seat, also constitutes the hinges, and the whole is constructed and fitted for use substantially as described.

34,205.—A. H. Hastings, of New York City, for Improved Refrigerator:

I claim the described refrigerator as an article of manufacture, constructed, arranged and used in the manner and for the purpose specified.

34,206.—Obadiah Hopkins, of New York City, for Improvement in Defending Redoubts by Shells:

I claim the application of the mechanical device, or its equivalent, for elevating and exploding shell above the covering at the apex, substantially as and for the purposes specified.

34,207.—C. T. James, of Providence, R. I., for Improvement in Hot Projectiles for Ordnance:

I claim making elongated shot with a separable point, which can be readily taken off and put on, substantially as and for the purpose specified.

And I also claim making elongated shot with separable point, substantially as described, in combination with the separable packing, or the equivalent thereof, to be expanded by the force of the discharge, substantially as and for the purpose specified.

34,208.—Rannah Justis, of Dublin, Ind., for Improvement in Churns:

I claim the horizontal open volute dasher, E, having door, G, wings, I, and detachable shaft, C, as and for the purposes set forth.

34,209.—S. D. Kendall, of Brooklyn, N. Y., for Improvement in Truss Girders for Bridges:

I claim the arrangement and combination, substantially as described, of the chords, A B C, posts, D D*, braces, E E, tension rods, G G, binding blocks, F F, and couplings, h h, the whole forming a truss girder for a bridge or other structure.

[This invention consists in a certain arrangement and combination of chords and posts, of cast-iron diagonal braces, vertical tension rods, and couplings of wrought iron, and binding blocks of cast iron, making a truss of great strength, in proportion to the weight of material employed in its construction.]

34,210.—Thomas Langham, of Philadelphia, Pa., for Improvement in Knitting Machines:

I claim, first, Producing a circular-ribbed fabric by means of a series of self-acting needles so arranged in radial grooves of two stationary plates and so operated that some of the needles shall operate on the outside of the fabric, while others operate on the inside of the fabric, as specified.

Secondly, The employment of radial reciprocating needles made self-acting at both ends combined with the devices described, or their equivalents, whereby the said needles may be so transposed as to operate either on the inside or outside of the fabric, without any interruption of the forces of knitting, as set forth for the purpose specified.

34,211.—L. G. Merrill, of Angels, Cal., for Improved Mode of Chopping to Pieces Ships or other Wooden Substances Under Water:

I claim the construction and arrangement of the several parts, A B C D E and a, in the manner described, to be operated by the action of the water, as described, for the purpose stated.

34,212.—F. S. Merritt, of New York City, for Improvement in Cooking Ranges:

I claim, first, The combination of a fire brick, c, and water back, E, arranged at the back part of the fire chamber, A, of a cooking range, so as to form a cylinder or a frustum of a cone, and be rotated so that either the fire brick or the water back may form the back of the fire chamber, as desired.

Second, The air-heating chamber, F, interposed between the fire brick, C, and water back, E, when the same are suspended and made to rotate, as and for the purpose specified.

Third, The tubular trunnions, a*, provided with passages, d d′, in combination with the sockets, b* b**, provided with the holes or openings, e e, and arranged and applied to the rotating water back, E, as shown, to automatically stop and start the flow of water through the water back, E, as set forth.

Fourth, Rotating the frustum, D, by means of the pins or teeth, f, and screw, H, when the latter is placed or formed on a rod, I, which passes through the range at one side of the fire chamber, so that the frustum can be turned by the operator or attendant at the front of the stove.

34,213.—A. W. Morse, of Eaton, N. Y., for Improvement in Track Clearers in Mowing Machines:

I claim, first, A track clearer to a grass harvester, capable of being expanded vertically and adjusted laterally, in combination with an adjustable handle, attached to it in such a manner as to regulate its capacity, as circumstances may require, substantially as and for the purpose set forth.

Second, The adjustable handle, M, when combined with a track clearer, by means of the socket and fastening, substantially as and for the purpose specified.

34,214.—James Piercy, of Bloomfield, N. J., for Improvement in Washers for Paper Pulp:

I claim the combination of the washer, B, its journal box, e, and the valve board, C, under a method of construction and operation, substantially as described.

34,215.—B. F. Ray, of Baltimore, Md., for Improvement in Harvesters:

I claim, first, Making the frame bar and the frame of the cutter bar of one continuous piece, having the curved part, x, as described.

Second, I claim the arrangement of the bearings and bases of the rocker shaft, in combination with the friction roller, and cam groove, as described.

34,216.—A. T. Russell, of New York City, for Improved Cork Screw:

I claim the application of the cam or eccentric and piston as a leverage or power to attach to cork screws, for drawing corks or stopples from bottles.

34,217.—Wm. Sellers, of Philadelphia, Pa., for Improvement in Mode of Transmitting and Arresting Motion:

I claim, first, The described device for transmitting and arresting rotary or vibrating motion, consisting of a ratchet wheel and pawl, when the ratchet wheel is the driver, combined with a stop or stops, the whole operating substantially in the manner set forth.

Second, The employment of a friction pad or its equivalent, in connection with a ratchet wheel, pawl and stop or stops, operating substantially in the manner and for the purpose specified.

Third, Combining with the device for transmitting and arresting motion, adjustable stops, for the purpose of varying the motion transmitted to any desired portion of a revolution, as set forth.

34,218.—C. A. Slack, of Frenchtown, N. J., for Improvement in Wagon and Carriage Brakes:

I claim the employment, in combination with the body, J, and bolsters, F G, of the inclined blocks, K, substantially as and for the purpose shown and described.

[This invention consists in having the body of the vehicle, or a frame on which the body rests, placed loosely on the bolsters, so that a sliding movement will be allowed the body independent of the running gear, and the former made by its own gravity, to actuate the brake in descending eminences, the body resuming its proper position and relieving the wheels from the brake when the vehicle passes on level ground.]

34,219.—E. Smith, of Cold Spring Harbor, N. Y., for Improvement in Harvesters:

I claim the pawl, W, actuated from the pulley, F, substantially as shown, in connection with the plate, U, provided with the serrated edge, f, and fitted on the shaft, M, all being arranged to operate as and for the purpose set forth.

I further claim, in combination with the pawl, W, and serrated plate, U, arranged as shown, the pulley, F, connected with the main frame, A, by the cord or chain, K, cam, H, and lever, I, the pulley, cam and lever being attached to the draught pole, C, and all arranged substantially as and for the purpose specified.

34,220.—Moritz Stange, of New York City, for Improvement in Pianofortes:

I claim the arrangement of the pins, f, with the pins, e e, and strings, c c, as shown and described.

[This invention consists in so applying and arranging the steady pins in the sound-board bridge, and in combination with the strings as to obviate the tendency to twist the bridge and so strain the sound board, consequent upon the usual arrangement of pins.]

34,221.—E. N. Steere, of Providence, R. I., for Improvement in Spindle Bolsters:

I claim the combination of the isolated absorbent, s, and the passager or conductors, e e, in connection with the ordinary metal bearing of a spindle bolster, the same being arranged and operating substantially as described, and for the purpose specified.

34,223.—S. S. White, of Philadelphia, Pa., for Improvement in the Manufacture of Artificial Teeth:

I claim the manufacture of mineral teeth, with pins having heads, d d, at their outer ends, substantially as and for the purpose specified.

34,224.—W. E. Worthem, of New York City, for Improvement in Architectural Sheet Metal:

I claim the new article of manufacture described, which I term architectural sheet metal.

34,225.—H. B. Ames, of Rrooklyn, N. Y., for Improvement in Hoop Skirts:

I claim the employment of a piece of leather or equivalent material between the metallic clasp, and the tape or cord, for the purposes, and as specified.

34,226.—C. R. Alsop, of Middletown, Conn., assignor to J. W. Alsop, of New York City, for Improvement in Revolving Firearms:

I claim the combination of the hammer cam, I, with the rearward extremity of the axis pin, D, in the manner and for the purpose shown and described.

[This invention consists in an improved mode of applying a cam, in combination with the hammer or cock, and with the rotary, many-chambered cylinder, for the purpose of forcing the latter forward the barrel, to make a tight joint therewith at the time of firing.]

34,227.—Nathan Ames, of Saugus Center, Mass., assignor to the Goodyear India-Rubber Stopple Co., of Boston, Mass., for Improved Bottle Stopple:

I claim, first, As a new article of manufacture, a stopple, consisting of a band, case or thimble, R, of rubber, or any of its compounds, and a core, W, of wood or other material, substantially as described and for the objects specified.

Second, Constructing the core, W, with an annular depression, d, for the purpose of confining the rubber, and allowing the same to be of greater thickness where the most elasticity is required.

Third, Constructing a stopple with a core, W, rubber band, case or thimble, R, and a thin coating of gutta percha, G, substantially as described and for the objects specified.

34,228.—Stephen Curtis, Jr. (assignor to himself and Henry Yale), of New York City, for Improved Ice Pitcher

I claim the construction and use in ice pitchers or other vessels of the spring bottom, C, supported upon springs, so as to yield to the impact of masses of ice or the like, and preserve the true bottom of the vessel, substantially in the manner and with the advantage set forth.

34,229.—Jehu Hatfield (assignor to Percy & King), of Troy, N. Y., for Improvement in Machines for Making Paper Boxes:

I claim the sliding bar, F, with the roller, G, attached, in connection with the stationary bar or bed, c, spring, E, slide, H, and bar, a, arranged substantially as and for the purpose set forth.

[The object of this invention is to obtain a machine by which strips of paper board may be very expeditiously bent and pressed into angular form, for the manufacture of angular polygonal paper boxes.]

34,230.—Henry Howson (assignor to W. F. Warburton), of Philadelphia, Pa., for Improved Box for Matches:

I claim the receptacle, B, with its projecting front and open top, when so hung to, and so combined with an outer frame or casing, A, of such a shape that the latter shall form a cover for the said receptacle, and when the latter is rendered by a weight or otherwise self-closing against the cover, substantially as set forth, for the purpose specified.

34,231.—J. A. Pease (assignor to C. A. Pease), of New York City, for Improvement in Tobacco Pipes:

I claim the combination of the perforated plug or cylinder, A, with the piston, E, and case or cylinder, C, in which it moves as described

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34,232.—W. H. Furness, of Quincy, Ill., for Improvement In Coach and Furniture Varnish:

I claim the use of coal oil or kerosene and yellow wax, as ingredients in the making of coach or furniture varnish out of the ordinary gums and driers, used for this purpose, and as set forth.

RE-ISSUES.

1,260.—F. E. Sickles, of New York City, for Improvement in Steam Engines. Patented Sept. 19, 1845. Extended Feb. 21, 1860—No. 910.

I claim imparting a co-existing movement to two reciprocating catch pieces, in the operation of the trip of cut off valves, substantially as described.

DESIGNS.

1,517.—S. D. Arnold (assignor to P. and F. Corbin), of New Britain, Conn., for Design for a Lift or Handle.

1,518.—J. B. Earnshaw, of Cincinnati, Ohio, for Design for a Monument.

1,519–1,520.—E. J. Ney (assignor to the Lowell Manufacturing Company), of Lowell, Mass., for Designs for Carpets, &c. 2 Patents.

PATENTS FOR SEVENTEEN YEARS.

The new Patent Laws enacted by Congress on the 2d of March, 1861, are now in full force, and prove to be of great benefit to all parties who are concerned in new inventions.

The duration of patents granted under the new act is prolonged to SEVENTEEN years, and the government fee required on filing an application for a patent is reduced from $30 down to $15. Other changes in the fees are also made as follows:—

On filing each Caveat	$10
On filing each application for a Patent, except for a design	$15
On issuing each original Patent	$20
On appeal to Commissioner of Patents	$20
On application for Re-issue	$30
On application for Extension of Patent	$50
On granting the Extension	$50
On filing Disclaimer	$10
On filing application for Design, three and a half years	$10
On filing application for Design, seven years	$15
On filing application for Design, fourteen years	$30

The law abolishes discrimination in fees required of foreigners, excepting reference to such countries as discriminate against citizens of the United States—thus allowing English, French, Belgian, Austrian, Russian, Spanish, and all other foreigners except the Canadians, to enjoy all the privileges of our patent system (except in cases of designs) on the above terms.

During the last sixteen years, the business of procuring Patents for new inventions in the United States and all foreign countries has been conducted by Messrs. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN; and as an evidence of the confidence reposed in our Agency by the Inventors throughout the country, we would state that we have acted as agents for more than FIFTEEN THOUSAND Inventors! In fact, the publishers of this paper have become identified with the whole brotherhood of Inventors and Patentees at home and abroad. Thousands of Inventors for whom we have taken out Patents have addressed to us most flattering testimonials for the services we have rendered them, and the wealth which has inured to the Inventors whose Patents were secured through this Office, and afterward illustrated in the SCIENTIFIC AMERICAN, would amount to many millions of dollars! We would state that we never had a more efficient corps of Draughtsmen and Specification Writers than are employed at present in our extensive Offices, and we are prepared to attend to Patent business of all kinds in the quickest time and on the most liberal terms.

The Examination of Inventions.

Persons having conceived an idea which they think may be patentable, are advised to make a sketch or model of their invention, and submit it to us, with a full description, for advice. The points of novelty are carefully examined, and a reply written corresponding with the facts, free of charge. Address MUNN & CO., No. 37 Park-row, New York.

Preliminary Examinations at the Patent Office.

The advice we render gratuitously upon examining an invention does not extend to a search at the Patent Office, to see if a like invention has been presented there, but is an opinion based upon what knowledge we may acquire of a similar invention from the records in our Home Office. But for a fee of $5, accompanied with a model or drawing and description, we have a special search made at the United States Patent Office, and a report setting forth the prospects of obtaining a Patent, &c., made up and mailed to the Inventor, with a pamphlet, giving instructions for further proceedings. These preliminary examinations are made through our Branch Office, corner of F and Seventh-streets, Washington, by experienced and competent persons. More than 5,000 such examinations have been made through this office during the past three years. Address MUNN & CO., No. 37 Park-row, N. Y.

How to Make an Application for a Patent.

Every applicant for a Patent must furnish a model of his invention. If susceptible of one; or if the invention is a chemical production, he must furnish samples of the ingredients of which his composition consists, for the Patent Office. These should be securely packed, the inventor's name marked on them, and sent, with the government fees by express. The express charge should be prepaid. Small models from a distance can often be sent cheaper by mail. The safest way to remit money is by draft on New York, payable to the order of Munn & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents; but, if not convenient to do so, there is but little risk in sending bank bills by mail, having the letter registered by the postmaster. Address MUNN & Co No. 37 Park-row, New York.

Rejected Applications.

We are prepared to undertake the investigation and prosecution of rejected cases, on reasonable terms. The close proximity of our Washington Agency to the Patent Office affords us rare opportunities for the examination and comparison of references, models, drawings, documents, &c. Our success in the prosecution of rejected cases has been very great. The principal portion of our charge is generally left dependent upon the final result.

All persons having rejected cases which they desire to have prosecuted are invited to correspond with us on the subject, giving a brief history of the case, inclosing the official letters, &c.

Caveats.

Persons desiring to file a Caveat can have the papers prepared in the shortest time by sending a sketch and description of the invention. The government fee for a Caveat, under the new law, is $10. A pamphlet of advice regarding applications for Patents and Caveats, in English and German, furnished gratis on application by mail. Address MUNN & CO., No. 37 Park-row, New York.

Foreign Patents.

We are very extensively engaged in the preparation and securing of Patents in the various European countries. For the transaction of this business, we have offices at Nos. 66 Chancery-lane, London; 29 Boulevard St. Martin, Paris; and 26 Rue des Eperonniers, Brussels. We think we can safely say that THREE-FOURTHS of all the European Patents secured to American citizens are procured through our Agency.

Inventors will do well to bear in mind that the English law does not limit the issue of Patents to Inventors. Any one can take out a Patent there.

Circulars of information concerning the proper course to be pursued in obtaining Patents in foreign countries through our Agency, the requirements of different Patent Offices, &c., may be had gratis upon application at our principal office, No. 37 Park-row, New York, or either of our Branch Offices.

Assignments of Patents.

The assignment of Patents, and agreements between Patentees and manufacturers, carefully prepared and placed upon the records at the Patent Office. Address MUNN & CO., at the Scientific American Patent Agency, No. 37 Park-row, New York.

It would require many columns to detail all the ways in which the Inventor or Patentee may be served at our offices. We cordially invite all who have anything to do with Patent property or inventions to call at our extensive offices, No. 37 Park-row, New York, where any questions regarding the rights of Patentees, will be cheerfully answered.

Communications and remittances by mail, and models by express (prepaid), should be addressed to MUNN & CO., No. 37 Park-row, New York.

Notes and Queries

H. B., of Ill.—The Franklin Institute publishes a monthly journal which contains a record of their transactions. The American Institute publishes a yearly volume of its transactions.

B. G., of Iowa.—We have no experimental data respecting the durability of gypsum rock as a building material.

J. A. S., of Colorado Territory.—Probably the best plan for separating gold from iron pyrites is roasting. If fuel is abundant the ore may be piled upon the fuel in the open air. As soon as the ore is sufficiently heated, the sulphur of the pyrites combines with the oxygen of the air to form sulphurous acid, which passes off in the form of gas; leaving both the iron and gold in fine powder. Fuel would be economized by using a reverberatory furnace, such as is employed for reducing iron ores. In any case there should be a free access of air to the ore.

W. G., of Mass.—We have no data which would enable us to form a correct estimate of the velocity imparted to a sledge hammer by a strong man. Assuming that the sledgehammer is brought down with a velocity of 160 feet per second, your 25 lb. weight would have to drop over a distance of 64 feet in order to produce the same effect as a 10 lb. sledge hammer.

L. A. D., of Ohio.—We do not know where you can obtain cast-steel pinions and small wheels. We think they are not made in any foundry. As you state, they would be very strong and durable, and might come into very general use for mill work.

G. W. R., of Mich.—If you warm your plaster molds, you will obtain good stereotype plates. The defects in your plates, in all likelihood, were caused by the metal becoming chilled before entering into the minute spaces of the molds.

Hawley, of Ind.—You will find our views of perpetual motion on page 353, Vol. I. (new series) of SCIENTIFIC AMERICAN. We have heard it stated that offers of rewards have been made for the discovery of perpetual motion, but have never seen the statement on any reliable authority, and do not believe it.

A. N., of Ill.—Supposing the points of the same size we think electricity would pass either into a body or out of it more rapidly by three points than by one.

R. L. H., of Conn.—The power of a turbine wheel with a discharge of 19 inches under a head of 12 feet is 3,739 or nearly 4-horse powers and that of a twelve feet overshot wheel with 25 inches water drawn under a 4-foot head is 2,827 at nearly 3-horse powers. In both cases the effective power is assumed to be 75 per cent.

A. A. W., of Ill.—Zinc is a volatile metal and when exposed to a high heat it passes off in the form of volatile fumes. By roasting your solder in an open furnace the zinc of it will be driven off, but the lead will be converted into a brown oxide totally useless for any purpose but a drier for paint.

H. W. C., of N. Y.—To make lacquer for brass work, take 2 oz. of shellac, and dissolve in 1 pint of alcohol, colored with turmeric. This imparts a yellow brass hue to the varnish; and, when dry, the metal to which it is applied is protected from becoming tarnished. By adding dragon's blood it becomes suitable for staining various kinds of wood. Articles to which this lacquer is applied should be kept in a warm place until the varnish is dry, or they will be dull and lusterless.

W. H., of C. W.—No recent treatise has been published on water wheels and American milling. There is no published work upon this subject that comes up to the practice of the present day; the back numbers of the SCIENTIFIC AMERICAN contains the latest and best information on the subject.

W. C. D., of D. C.—Send us a full account of the experiments made with your improved rifle having a small bore and a greatly-enlarged charge chamber.

Money Received

At the Scientific American Office on account of Patent Office business, during one week preceding Wednesday, Jan. 29 1862:—

W. H. B., of N. Y., $20; R. R., of N. Y., $22; G. McN., of Pa., $20; L. L. W., of N. Y., $45; J. B. R., of N. Y., $110; L. U. S., of N. Y., $20; J. D. E., of Ill., $55; J. A. W., of N. Y., $25; M. and D., of N. Y., $40; W. T., of Mich., $25; S. P., of Del., $15; G. P. and W., of Ill., $25; D. G., of N. Y., $25; J. H. of Mass., $20; J. R. T., of N. Y., $25; W. H. H., of Conn., $15; C. C., of Pa., $15; C. M., of N. Y., $10; H. K. A., Jr., of Iowa, $15; E. R. McC., of Iowa, $15; C. E. B., of Conn., 50; T. and L., of N. Y., $10; J. W. E., of Ill., $25; T. S., of N. Y., 10; R. H., of Ill., $20; C. W. H., of N. Y., $20; J. L., of Mass., $20; V. and L., of Iowa, $20; T. J. B., of N. Y., $20; R. P. W., of N. Y., $20; S. H. M., of O., $30; D. J. M., of O., $15; H. S. W., of O., $10; R. W. G., of Me., $15; H. R., of Ill., $30; A. S. J., of Ill., $25; J. H. E., of Pa., $15; C. E. L. H., of Conn., $35; O. R. B., of N. Y., $15: W. S. A., of Iowa. $10; J. H. L., of Pa., $15; G. T., of N. Y., $15; C. P, B., of Conn., $15; A. McN., of N. J., $15; C. E. S., of Wis., 10; C. N., of N. H., $15; R. P. W., of N. Y., $25; E. and W., of N. Y., $20; I. C., of N. Y., $20; J. C., of Mass., $20; C. M. S., of Conn., 48; N. A., of N. Y., $20; E. A. S, of N. J., $22; W. L. G., of N. Y., $10; W. H., of L. I., $40; W. M, of Mass., $25; C. B. M., of Ill., $25; C. W. R., of Mich., $15; M. D., of N. Y., $15; H. N., of N. Y., $15; G. and M., of N. Y., $25; S. and A., of Mass., $15; R. and H., of N. J., $10; C. W., of N. Y., $15; D. and K., of Mass., $15; C. W. H., of Conn., $28.

Specifications and drawings and models belonging to parties with the following initials have been forwarded to the Patent Office from Jan. 22 to Wednesday Jan. 29 1862:—

R. R., of N. Y; J. B. R., of N. Y.; R. H., of Ill.; A. S. J of Ill.; H. S. W., of Ohio; G. B. O., of N. Y.; M. M. and M., of Mass.; B. J. C. H., of N. Y.; J. R. T., of N. Y.; E. C. B., of Conn.; M. and D., of N. Y; L. L. W., of N. Y.; E. A. S., of N. J.; T. S., of N. Y; D. G., of N Y.; J. A. W., of N. Y.; D. B., of Conn.; M. D., of N. Y.; W. L. G., of N. Y.; R. P. W., of N. Y; L. E. O., of Conn.; C. M. L., of Conn.; J. D. C., of Ill.; G. P. and W., of Ill.; C. B. M., of Ill.; J. W. H., of N. J; C. E. L. H., of Conn.; J. H., of Mass.; J. W. E., of Ill.; E. P. B., of Conn.; G. and M., of N. Y.; W. H., of N. Y.

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REFERENCES—Marshal P. Wilder, Esq., Boston, Commissioner to the World's Fair; Frederick H. Sumpson, Esq., President Massachusetts Charitable Mechanic Association; Oliver B. Dorrance, Esq., United States General Appraiser, No. 177 State street, Boston; Henry A. Gane, Nos. 50 and 52 Cornhill, Boston; H. Griffin & Son, Nos. 54 and 56 Duane street, New York; Ezra Carter, Jr., Esq., Portland, Maine; Hall J. Roberts, Esq., President State Central Bank, Concord, N. H.; John Gates, Esq., Worcester, Mass.; Cooper & Frye, No. 522 Minor street, Philadelpeia, Pa., Charles F. Wilstanch, Esq., President Ohio Mechanics' Institute, Cincinnati, Ohio; George W. Simpkins, No. 251 Main street, St. Louis, Mo. 5 1

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RENSSELAER POLYTECHNIC INSTITUTE, TROY, N. Y.—The seventy-sixth semi-annual session of this Institution for instruction in the Mathematical, Physical and Natural Sciences will commence Feb. 19, 1862. A full course in Military Science is now in progress. Further information, with the Annual Register, can be obtained of Prof. CHARLES DROWNE, Director. 3 6*

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A MESSIEURS LES INVENTEURS—AVIS IMPORtant. Les Inventeurs non familiers avec la langue Anglaise et qui préféreraient nous communiquer leurs inventions en Français, peuvent nous addresser dans leur langue natalle. Envoyez nous un dessin et une description concise pour notre examen. Toutes communications seront regues en confidence. MUNN & CO.,
SCIENTIFIC AMERICAN Office No. 37 Park-row, New York.

NEW YORK OBSERVER FOR 1862.—IN ASKING the aid of all who may desire to extend the circulation of the *New York Observer*, it is proper for us to state distinctly the position it occupies with reference to the present condition of public affairs in our beloved country.

Having always maintained the duty of good citizens in all parts of the land to stand by the Constitution, in its spirit and letter, when that Constitution was assailed and its overthrow attempted, we accordingly at once gave a cordial support to the Government in its patriotic endeavor to assert its lawful authority over the whole land. Believing secession to be rebellion, and when attempted, as in this case, without adequate reasons, to be the highest crime, we hold

1. That the war was forced upon us by the unjustifiable rebellion of the seceding States.

2. That the Government, as the ordinance of God, must put down rebellion and uphold the Constitution in its integrity.

3. That every citizen is bound to support the Government under which he lives, in the struggle to reëstablish its authority over the whole country.

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Bees and their Management.

The habits of the honey bee have been more closely studied, and are better understood than those of any other insect. Most persons understand the general constitution of a colony of bees. It consists of one female—the queen; a few hundred males—the drones, and from 8,000 to 50,000 undeveloped females—the workers. The males are perfectly idle, and are of no use except to perpetuate their race. Once in the summer the queen takes a flight up into the air, which is her bridal trip. She meets a drone in the air, and returns to lay the eggs for a whole colony. The drones have no stings, and after the hymenial flight the workers fall upon them and murder them all. The writer of this has watched a swarm busy at this work of slaughter through the whole afternoon of an August day. The brave little worker would seize his lazy antagonist, of nearly twice his size, and, bending his body, would thrust his deadly dagger between the joints of his enemy's rings. The sting was almost instantly fatal, and the carcass was dragged to the edge of the shelf and dropped off into the grass.

There are many persons in this country who have made the care and study of bees the business of their lives; constantly discovering new facts in relation to their habits, and always striving to render their knowledge available in improved methods of management. The past volumes of the SCIENTIFIC AMERICAN contain a pretty complete history of these improvements, and we now illustrate another—one of the most important that we have ever described. We give the inventor's own clear description:—

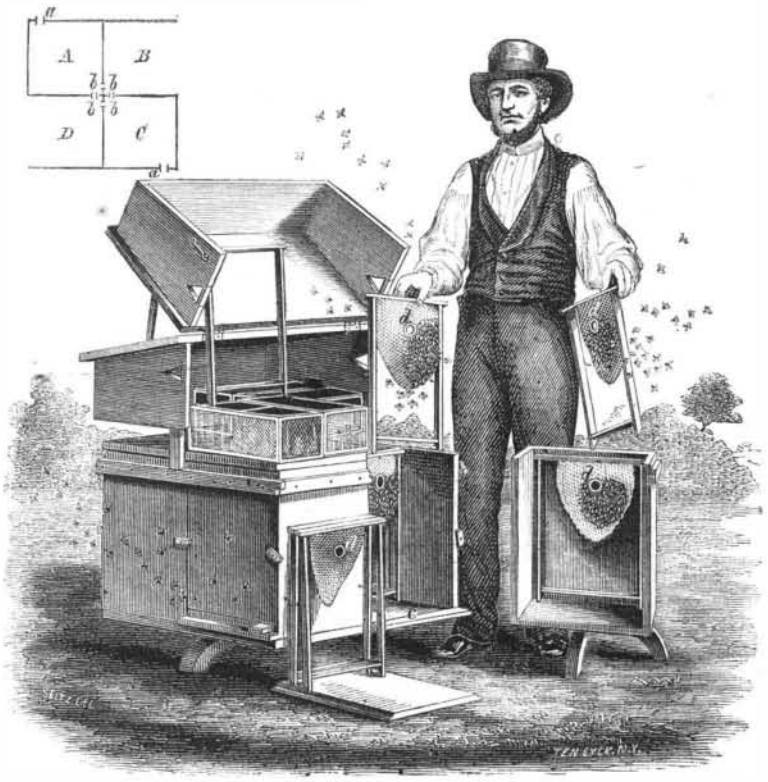
This hive is intended, when full, for wintering, to contain four separate independent colonies of bees. In spring, as soon as bees begin their labors of the season, we transfer bees' comb, by means of the movable comb frames, to other hives having but two stocks in the premises. These occupy opposite apartments, the movable fronts of the now tenantless apartments being removed, and the temporary passage ways through the central walls of the hive, at *b b b b*, so adjusted that a part of the bees, occupying A, may pass through B to and from the fields, while a part of those of C, in like manner, use D as a passage way, at the same time that the greater portion of both stocks use the more direct and larger outlet at *a a*. When drones appear in spring, and we desire to increase the number of our stocks, we open the hive, A, and transfer a card of comb, brood and bees (being careful not to get the queen), to the empty part, B, at the same time shutting off the communication with the parent stock, and putting into place the adjustable front and top. Many of the bees will return to the parent hive, but enough of those that have been in the habit of using B as a passage way—knowing no other—will thus be detached from the mother stock, and having the necessary brood, will set themselves about rearing a queen, while the old hive, retaining their fertile queen, suffers no detriment, but, on the other hand, multiplies all the faster, rapidly filling the space made vacant by the removal of the comb frames, with new worker cells in which the queen finds ample room to deposite her eggs, thus early in the season securing the greatest rapidity of breeding.

But to return to our little colony. The tenth day after transfer we open the litter swarm, cutting out all but one of the queen cells (of which we shall find from three to seven annually) with which we start other swarms. We now, also, open the stock swarm, C, transferring a comb frame in precisely the same manner before described, in this case to D, starting another small colony, and to this latter we attach one of the queen cells taken from B. We have now to let our hive rest from eight to twelve days for the purpose of giving time for the maturity of the young queen, and their fertilization by flight with the drones, when, if the latter are abundant, we shall find, on inspection of our litter swarms, that they are in possession of new-laid worker eggs of the young queens. If, now, we turn the hive one-quarter the way round, we shall throw out a swarm of bees into each of the infant apartments, for it is well known that the largest portion of a swarm of bees will return to the accustomed spot, after the removal of their hive to a new location—in the present instance to remain, for the reason that a queen and brood is found, together with abundant room and consequent labor before them. Gauze-wire curtains are provided through the partition walls as a safeguard against quarreling.

Where greater rapidity of multiplication is desired, our stock is left in each quadruple hive, in spring, preparatory to commencing the process of artificial swarming, when substantially the same process is resorted to, but to describe which and the multiform mysteries and laws of the hive and honey bee, the limits of this paper denies.

Among the objects secured by this new hive and system of management are the following;—Colonies are multiplied to any desirable extent more readily than can be done by any other hive in use. All loss of swarms by flight to the woods is entirely prevented. All watching for the issue of swarms during the time is done away with. By the use of a new style of frame, combined with this hive, the removal of combs and bees, by any one, without the least precaution, is safely accomplished. The revolving principle for artificial swarming, now first presented to the public, renders the perfect equalization of colonies an easy operation. A winter passage through the combs is provided, for the purpose of more safely wintering them. In the quadruple hive, four times the ordinary amount of animal heat is secured in one body, for the same object. The form of the movable frames is such that combs may be readily transferred from the common box hive to them, at the same time they are kept firmly in place, perfectly parallel with each other, and are not too shallow for safely wintering. The presence of a fertile queen is at all times insured, thus effecting a saving of at least twenty days' time in breeding over the natural method of swarming—no eggs being laid in a hive after having thrown out a first swarm of the current year, under from twenty to thirty days.

Patents for this hive were granted on the 30th of July 1861, and the 14th of January, 1862, and further information in reference to it may be obtained by addressing the inventor, Martin Metcalf, at Grand Rapids, Michigan.



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